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ANNALS
OF
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VOL. XX. MARCH, 1911. No. 1.

I.

THE THERAPEUTIC VALUE OF RADIUM IN THE TREATMENT OF DISEASES OF THE UPPER AIR TRACT.

BY WOLFF FREUDENTHAL, M. D.,

NEW YORK.

Directly after the discovery of radium by the Curies and as soon as it could be purchased in this country, several investigators began experimenting with it. Some of these stopped short; their expectations were too high and were not fulfilled; others unequivocally lauded it to the sky, and their followers met with severe disappointment and dropped it. While discussing the merits of radium at a meeting of medical and nonmedical men in this city, a gentleman recommended the fumes or inhalations of it for almost all diseases, including tuberculosis and cancer. Like remarks served to discourage its application, and, in fact, very little was heard about it during the next five years. There were a few men in this country, however, who continued its rational application, and the writer appears to be the only one who applied it systematically in diseases of the upper air tract. Having a priori a rather pessimistic view of every therapeutic agent, his expectations were not high. Even to-day, after years of experience, he does not believe that radium is a panacea for everything, but he is convinced that it is a most wonderful remedy in certain diseases, if correctly applied.

Epithelioma of the skin is one of these. It is true that these cases are improved, and even cured under X-ray treatment, but, as you know, that is a complicated procedure, and not always without danger. This is especially important in the cases seen by me which affected the nose and its vicinity, the upper lip and the cheek. A scar or a burn left after the application of the Roentgen rays is unsightly in man or woman. In the four cases treated with radium we have had very gratifying results.

Case 1. (Presented to the Section on Laryngology of the New York Academy of Medicine, December 23d, 1909.) S. S., 42 years of age, noticed a blister on his nose eight years before consulting me, which broke and discharged a watery secretion, and then dried up. Later, other blisters appeared and disappeared on the left ala nasi, the upper lip, and the neighboring parts. The patient consulted one physician after another—that was in Russia—and finally fell into the hands of a barber, who cauterized him so energetically that a perforation was produced which necessitated a plastic operation of the lip, etc. This cured him for the time being, but four years later the old trouble recommenced. The blisters appeared and disappeared, and he was rarely free of them. During the last four years, however, the blisters did not break. He has been in this country for three years, and still suffers in spite of everything he has tried.

The first time I saw him he showed the deep seated variety of rodent ulcer (epithelioma); the left ala nasi was almost gone, and along the two scars of the former operations as well as in the left introitus nasi the surface was brownish red or purplish, and secreting scantily. It was sharply defined, with rolled and raised borders, and deep excavations (See Plate I). He was put into the hospital and radium was applied for twenty-four hours steadily (10 mgr. of 1,000,000 radioactivity). This was somewhat heroic treatment, since I was not sure how deep the effect of the radium would be. But, on the other hand, something radical had to be done, as everything else had been tried in vain. When the radium was removed, there was a mass of deep ulcerations spreading all along the scars and into the nose. These, however, turned out to be benign in character, as they healed under a mild salve within a short time. In order to prevent a recurrence, radium was applied off and on for two hours at a time, and now he has been cured for fourteen months (See Plate II).

The next two cases which the writer has treated with radium were women of twenty-one and twenty-six years, respectively. In both cases the ala nasi was affected. Exposures of twenty to forty-five minutes were tried repeatedly, without any visible effect. Then radium was applied over night, i. e., in one case for fourteen hours; in the other, for twelve hours, and in both cases with splendid results. A fourth case, which was reported in 1906, did not show any improvement.

A year ago Langlet and Sourdeau* published a series of 122 observations of epithelial cancer, made at the Hôpital St. Louis at Paris. They report 87 per cent cures, and believe that of all the cancers that fall into the domain of dermatology not more than 5 or 8 per cent should be unsuccessful. Compared with these numbers, my observations are too limited to allow final conclusions.

Yet my results were so excellent and so easily obtained that the classical remark made by one of the patients may be repeated here: "It worked while I was asleep."

Of other conditions for which radium has been tried, the writer would refer to one of scleroderma of the bridge of the nose and adjoining parts. The dermatologists who saw the case differed in regard to the diagnosis. Some thought it was scleroderma, others pronounced it to be lupus erythematosus. (See Plate III.) The case was referred to me with the idea of having something done intranasally, if possible, as extranasal treatment had been of no avail. The patient, a girl of nineteen, had an atrophic condition of the nasal mucosa, with masses of dried scabs. That process was especially marked on the right side, i. e., the side that showed the lesion externally. After applying radium for several times in the dispensary for from twenty minutes to an hour, without any effect whatever, the patient was sent to the hospital and radium was applied for fourteen hours uninterruptedly. She left the hospital unimproved, but on the fifth day after her dismissal she had a profuse epistaxis, and it was with difficulty that one of my assistants stopped it. On the following day a similar hemorrhage occurred. Her condition at present is about the same.

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*Langlet et Sourdeau: Une statistique et quelques réflexions a propos du traitement radiotérapeutique, etc. Annals de Dermatologie et Syphilographie. Fevrier, 1909.

I have tried radium in a number of cases of atrophic rhinitis, but never for more than ten or twenty minutes at a time. Bleeding occurred quite frequently, and generally two or three days after the application of the radium. The results of the treatment were not encouraging, so that radium was given up in these cases.

But by far the most important affections on which I have used radium are the malignant tumors. If radium is of any value in these cases, it is certainly a blessing to humanity. Permit me to first give you the histories of some of my cases treated during the last few years.

Case 1 was referred to me by the kindness of Dr. Harmon Smith, who furnished me with the following history: F. L. H., aet. 43, a driver, was admitted to the Manhattan Eye, Ear and Throat Hospital on December 18, 1909, with a nasal obstruction on the right side. Family history negative; no specific history. Eight years previously had noticed some discharge from the right nostril. There was a large mass filling the right naris and pharynx; the tonsils appeared normal. The polypi were cleared out, and at this time a suspicion was aroused as to the character of the growth. A specimen was sent to the laboratory, and the report was: "Columnar-celled epithelioma." At subsequent sittings, more polypi were snared out, and reports always returned the same. Trypsin was given, but with no avail. The patient was referred to a general surgeon, but rebelled against operation.

On March 18, 1910, I saw him for the first time. Radium was immediately applied. The radium was in a small tube and was passed up the nose from the outside, leaving it there for ten minutes. Two days later it was left in for sixty-five minutes.

Three days later, on the 22nd, the patient noticed that he was using fewer handkerchiefs than heretofore, and for the first time I saw some pus in the middle meatus. There was a decided tumefaction in the middle meatus, occupying the middle part of the naris, and this was the mass Dr. Smith had referred to. The best thing would have been to open the antrum and put the radium right in, but the patient objected to all operative interference, so we had to place it in the naris.

On March 22nd the radium was left in place for two hours, and every third day after that it was left in for two hours, or a little more. On April 2nd the radium was applied (10 mg. of one million radioactivity) for forty-two hours. There was no reaction after that. On April 20th an X-ray picture was taken, and though the picture is not very satisfactory I would like to mention it. On the right side a slight cloudiness can be seen, which may be pus, or it may be some tumor or some other foreign growth. At any rate, after that last application of radium, the mass began to grow less. During April and May the radium was applied twice a week, always for two hours. There was always some pus in the middle meatus which seemed to me at that time to indicate a breaking down of tissue within the antrum. I am now convinced this was the case. The tumor, however, did not disappear entirely, and on June 5th the radium was applied for forty-two hours again. At this time, seventy mg. of the strongest radium we have, 1,800,000 radioactivity, was used. Some men who were consulted warned me against it, but I saw no danger in it. In fact, the reaction after applying this strength was almost nil. The nose was slightly sore, and that was all. The tumor disappeared almost entirely. There is a small portion left, but it is a question whether it is the original epithelioma or a benign polypoid growth. The patient will not have anything further done to it. He is perfectly well, has gained flesh, is breathing perfectly through the nose, and is feeling very happy over his condition. I do not believe that we will judge amiss in putting this case down as cured. It is now eight months since the last radium treatment, and there is no recurrence noticeable.

The following case is of equal interest:

Case 2, referred to me by courtesy of Dr. S. McCullagh, with the following history:

"Osteosarcoma of the Superior Maxilla. Operation. Rapid Recurrence. Mary S., age 18, born in Ireland. Was first seen at the Manhattan Eye, Ear and Throat Hospital, December 2, 1908. For many years she has had a sinus under the right cheek, which discharged at various times. Five months ago she first noticed a growth on the cheek below the inner canthus of the right eye. It is cystic in character, not painful or tender. A needle was introduced at the junction of the cheek and gum, and the cyst was aspirated by Dr. Coffin.

December 19th. The growth is larger than before aspiration. The nasal bones themselves are pushed over to the left side of the face, and there is marked fullness of the right side of the face.

December 21st. Under gas and ether the cheek was dissected up and the mass removed with scissors. It stripped readily from the bone, but was amalgamated with the soft tissues of the cheek.

Pathologic report: 'I presume this represents the base of the growth, since it contains nothing indicative of cyst formation. Fibrous connective tissue filled with the products of inflammation, with underlying muscle tissue, forms the characteristics of the piece submitted for examination.

(Signed) 'JONATHAN WRIGHT.'

March 3rd. The pushing of the nasal bones to the left side of the face and the thickness of the bony tissue under the cheek having become much more marked, a more radical operation was decided upon. An incision was made from just below the inner canthus of the right eye along the junction of the nose and cheek, through the median line of the lip, and thence down to the free edge of the lip. The whole cheek was then dissected off and reflected. The bone was eroded and had a worm eaten appearance over the antrum. The anthral wall and the nasal process of the superior maxilla were much thickened. Practically all of the anterior aspect of the superior maxilla was removed. The antrum was clean. The wound was closed with horsehair sutures. Primary union of skin occurred.

Pathologic report: 'This is a fibrous tumor containing a large amount of newly formed bone. Owing to the action of the decalcifying fluid, the nature of the growth as to its malignancy cannot be established. I suspect from the looks of the thing and the short history that it may be an osteosarcoma.

(Signed) 'J. WRIGHT.'

April 6th. There seems to be a recurrence of the growth at the external edge of the right nasal bone.

April 23rd. A mass about the size of a hazel nut has developed at this site.

April 28th. Under gas and ether the old incision was reopened and the cheek again reflected. The small remaining portion of the nasal process of the upper maxilla, the right nasal bone, and the nasal process of the right frontal and the internal wall of the antrum were removed. There was no evidence of recurrence in the zygomatic region. The wound was sutured as before. Primary union of skin occurred.

Pathologic report: 'Apparently we have an atypical proliferation of fibrous connective tissue cells from the surface periosteum. In many places, this is thrown into configurations more or less characteristic of fibrosarcoma, but in these masses of new connective tissue numerous cells characteristic of newformed bone cells are seen springing from the fibroblasts. There are no giant cells, and in the absence of more satisfactory sections I should be inclined to base a diagnosis rather upon the clinical features than upon the microscopic findings. So far as these go, I think they would tend to confirm a diagnosis of osteosarcoma.

(Signed) 'J. WRIGHT.'

June 7th. No evidence of recurrence.

November 1st. What seems to be a small retention cyst above the alveolar process, due to closure of a small sinus, has developed. This was opened, wiped with orthochlorphenol, and packed. There is no evidence of recurrence in the bony parts.

March 9, 1910. Recurrence of the tumor has taken place just above the alveolar process. Specimen removed.

Microscopic examination: 'Fibrosarcoma.

(Signed) 'JONATHAN WRIGHT.'

The patient was then referred to Dr. Freudenthal for treatment with radium."

She came to me on March 30th, and I applied radium for thirty minutes. My former experience made me a little more courageous. The radium was applied again two days later, but no effect was noted. On April 26th, a strong mass of radium, 70 mgr. of 1,800,000 radioactivity, was applied for fifteen hours. Immediately afterward the face became more swollen, and there was a purulent discharge from the nose which lasted for two days. On April 30th I saw her again, and the inferior turbinated body was much more swollen and edematous. On May 14th she told me there was a good deal of purulent discharge from the nose and it felt sore. On that side she bleeds easily. However, the upper lip felt softer than before. I saw no material improvement in the patient, and on June 9th applied the radium again for thirty-six hours at one stretch. Two days later she complained of pain in the right ear, and an otitis media purulenta set in. This was not due to the radium, but to the following circumstances: The radium tube had to be fastened in the nose, for several reasons—one being that it should not fall out, and the other being that the patient should not remove it—the tube being of considerable value; the plugging of the nose was quite firm, and that produced the ear complications; besides this, the whole right side of the nose was edematous and swollen so that she could not breathe through it at all; the skin over that side was also swollen and edematous. However, the swelling and edema subsided promptly, and she breathed more easily than before. The discharge from the right side ceased in four weeks.

The patient was again seen on September 17th, at which time the swelling of the nose had entirely subsided, though there was still a purulent discharge. This discharge seemed to come from an incisor tooth. On September 27th she again came with her whole face swollen from erysipelas. She was sent to Bellevue, and came back cured of the erysipelatous condition, since which time she has been normal. There is now no trace of the former condition, and the case may be considered absolutely cured. (She was seen again March, 1911.)

CASE 3, referred to me through the courtesy of Dr. W. P. Wooster, of this city. Mr. F. W. H., aet. 76, former superintendent of a business house. Ten years before consulting me had suffered from "nervous prostration," since which time he is mentally not perfectly normal. For the last two months has had difficulty in swallowing and a mild dysphagia. On inspection, a neoplasm was found, involving the left tonsil, spreading anteriorly and upward. Microscopic examination showed this mass to be a primary epithelioma of the tonsil. Radium was applied several times, but had to be given up on account of his mental weakness. Result nil.

Case 4. Epithelioma of Tonsil. Jacob C., aet. 50, was referred to the writer through the courtesy of Drs. Jarecky and Joseph Weinstein. Dr. Weinstein had seen the patient first and had made the diagnosis of epithelioma of the tonsil (by his own microscopic examinations). The patient, who is a rather dull person, gave the following history of his case: Two months before calling upon me he had noticed a swelling on the right side of his neck. Has had no pain, neither when swallowing nor when touched; eats and sleeps well, and has absolutely no complaint excepting the swelling on the neck; has never been sick as far as he can remember, and has never had lues.

On examination I found a mass as large as a fist on the side of the neck, corresponding to the vicinity of the right tonsil; no fluctuation, no pain. The tonsil itself was enlarged to about the size of a big plum. The apparent neoplasm also included, to a slight degree, the tongue. A piece of the tonsillar tissue was removed—followed by slight bleeding—and sent to Dr. Jonathan Wright, who kindly furnished me with the following report:

"The specimen from the tonsil shows, on sectioning, an islandlike infiltration into the lymph spaces of cells which it is impossible definitely to differentiate from endothelium and from the basal layer of the epithelium of the surface, so far as their morphology is concerned, but by running through a number of sections their origin from the basal epithelial cells of the surface investment of the tonsil is plainly made out. They have grown into the lymph spaces in this island form, being everywhere entirely separated from the surface cells, and it is this fact, I think, which has frequently led pathologists to class this kind of growth as an endothelioma of the tonsil: but if the sections are numerous enough the connection can always be made out."

Microscopic diagnosis: "Basal celled epithelioma (Krompacher.)"

On November 6, 1910, radium treatment was commenced. The patient was rather awkward and it was a rather difficult matter to press his tongue down and introduce the radium (on a holder). It could not be kept in longer than twenty minutes. After that date, however, the radium was applied for fifty to sixty minutes, but the treatment was not satisfactory to me as the patient was unreliable and turned the point occasionally to the other side, etc. Ulcerations of the tonsils and tongue appeared soon.

Up to December 11, 1910, he received treatment for twelve hours altogether, without any diminution of the mass outside being noticeable. Inside, the tonsil was somewhat ulcerated.

The result of our treatment thus far being almost nil, it was decided that the application of the radium had to be pushed more vigorously. Consequently, on December 17, 1910, I made an incision outside over the affected parts and buried two tubes of radium deep in the tumor mass at different places. The one tube contained seventy mgr. of radium of 1,800,000 radioactivity, and the other, ten mgr. of 1,000,000 radioactivity. The two tubes were left in for 50 hours. The parts outside did not look much changed immediately afterwards, but very soon began to slough.

On December 28, 1910, it was noticed that the tonsil was very much ulcerated. On that date the radium was again put into the outer wound (the weaker tube), and was left in for 72 hours. In the meanwhile, the patient was not confined to his bed, but walked about in his house. After that, however, he seemed somewhat weak, and on January 12, 1911, when Dr. Weinstein changed the dressing, about half a tumblerful of yellowish pus came out. On January 18th, the smaller tube was again inserted and removed on January 21st, being in situ for 72 hours again, the patient meanwhile going to his home in Brooklyn and reporting every morning. The tube was immediately reinserted, and left in for two days more, so that it was in place for 120 hours, or five days, continuously. The patient felt none the worse for it, and the tumor was somewhat diminished in size.

Case 5, referred through the courtesy of Dr. Thomas J. Harris. The history as given to me partly by Dr. Harris and partly by the patient, is as follows: Mr. A. J. P., a patternmaker of New Britain, Conn., aet. 45, fell sick with the grippe in June, 1910. Had pain in the back and in the left ear. When something "broke" in his ear, he felt easier, but became hard of hearing. Immediately after that his throat began to trouble him; something seemed stuck in it, which he could not get out, and his speech became so bad that he could not be understood. He was admitted to the Manhattan Eye, Ear and Throat Hospital, where Dr. Harris examined him and found a growth situated in the nasopharynx and occupying the left side. This was found to be a lymphosarcoma, and the patient was transferred to the Presbyterian Hospital for operation by Dr. Blake, which was done in October, 1910. He came to me ten days after leaving the hospital, November 9, 1910, and I found that the mass had already commenced growing again. There was a mass coming up on the upper part of the septum narium, and another on the roof of the pharynx on the left side. The tissues all seemed infiltrated, the left side more than the right, but the latter was not entirely free. Radium was applied on November 10th for ten minutes; on November 11th for thirty-two minutes, and on November 12th for one hour. On November 13th the patient complained of pain in the nasopharynx and was allowed to go to his home. The pain, however, was not due to the radium itself, but to the tube, which was too long. It was shortened as much as possible, and inserted again, on November 16th and 17th, for one hour respectively; November 18th, two hours and ten minutes; November 19th, one hour and fifteen minutes; 20th, 21st and 22nd, for one hour or two hours each time. Ulcer visible in the vault of the pharynx. On November 23rd, radium was applied for one hour and fifteen minutes—slight bleeding; sent to his home; November 28th, ulcer almost disappeared; radium one hour. November 29th, radium two and a half hours; 30th, one hour and fifteen minutes. December 1st, radium for two hours—a good deal of pus and blood came out when tube was removed. December 2nd, radium two hours; 3rd, one hour; 4th, one and a half hours—leaves for his home again.

On December 21st he returned, and, by agreement with Dr. Harris, he went to the Manhattan Eye, Ear and Throat Hospital. I had rings attached to both ends of the tube so that threads could be fastened. Dr. Harris inserted one end of the string through the left naris—which was accomplished with difficulty on account of a deviation of the septum—and pulled the tube up into the nasopharynx. Then both strings were fastened around the ear, and the patient was given a mild diet and ordered to bed. After 72 hours the radium was taken out, and a sore was found in the nose and a deeper one on the side of the uvula, from the thread cutting through. In the left upper region there was an excavation and ulceration, and a tumefaction was visible toward the roof of the mouth. The mass on the vomer seemed to be less on the left side; on the right side, no change. The radium had given him little trouble during these three days, but it must be remarked that he had a very patient nature. He returned home after that, and I saw him only occasionally.

On January 24th the following status was taken: All thickening at the posterior end of the vomer has disappeared. There is still some ulcerated surface at the vault of the pharynx on the left side. That portion is ulcerated, but it will most likely heal soon. A portion of the cushion of the eustachian tube is gone. Whether or not this is due to the radium, cannot be said. In all probability, the patient will have no recurrence of his trouble. He will, however, be kept under observation for the next six months. (See plates No. IV and V.)

In 1905 the writer published a series of cases treated with radium, a few of which will be mentioned. The effect of radium can best be studied in the larynx.

Mrs. Y. presented a typical picture of laryngeal tuberculosis. I said at that time: Remarkable were the granulations (infiltrations) springing up from different parts of the larynx, thus diminishing its lumen materially. For that reason we were compelled twice, on account of slight dyspnea, to interrupt the treatment. A day sufficed to restore these parts and widen the glottis. The granulations that sprang up so quickly after a few exposures are analogous in one respect to the changes produced by the injection of the old tuberculin. All those who remember the first injections of Koch's old tuberculin, at the end of 1890 and early in 1891, when large doses were given, will perhaps also recall the occurrence of large granulations arising in the larynx in cases complicated with tuberculosis of that organ. The patient died about six months later from pulmonary tuberculosis. During that time she had little trouble with her throat.

Another case reported in 1905 is the following:

Case 7. J. J., a tailor, 60 years of age, consulted me in the fall of 1904. His trouble had commenced a year previously, with a toothache. Not being in a position to spare the time, he did not consult a dentist until six months later, when the pain had become quite severe and a swelling appeared in the throat. He was told at that time that he had a malignant tumor. When I first saw him the right tonsil was greatly swollen, and three large segments could be distinguished. This swelling extended some distance to the inferior maxilla. At the same time had an anchylosis of the right arm, with swelling in the elbow joint. The whole process seemed to indicate a syphilitic origin, and he was given salicylates and iodide of potash. The elbow joint improved quickly and has not bothered him since. The tumor of the tonsil very soon proved to be epithelioma. All operative intervention being refused, radium was applied. The effect was remarkable. The tumor commenced to increase rapidly in size, and after a few sittings broke down, a large quantity of pus being evacuated. The patient experienced great relief, but this did not last very long. The mass soon spread all over and he died several months later. Result of radium treatment, nil.

Case 8. S. C., age 60, has been hoarse for the last five months, and has been treated by a throat specialist, who referred him to me. On April 17, 1905, when I first saw him, there was a diffuse swelling of the left vocal chord, more pronounced in its posterior third and extending somewhat to the arytenoid and ventricular band of the same side. It was shown microscopically that this tumor was a carcinoma of the larynx. On April 17th we began with radium, which was applied for five minutes. April 24th, same treatment. On April 25th the radium was omitted as signs of marked edema and venous stasis of the uvula were noticed. On April 26th the uvula appeared more natural, and patient said he had less pain and could swallow more easily; radium used again, and also on the 27th, 28th and 29th, during which time the venous hyperemia disappeared. On May 1st an ulceration on the left side of the uvula was plainly visible, and was more pronounced on the following day. Radium, of course, was omitted again; more marked dysphagia. The ulcer healed soon, but, progress being very slow, it was considered best to have a complete laryngectomy performed. This was done at Mount Sinai

Hospital by Dr. A. V. Moschcowitz. The patient is still alive (six years later).

CASE 9. Mrs. A. W., aet. 63, complains of difficulty in swallowing. (This case is given here as representing a different series of cases.) Status praesens. June 14, 1905. A large tumor is found on the right side of the neck, extending quite a good way back. The interior of the larynx presents a paralysis of the right vocal chord and an infiltration of the posterior wall of the larynx. Undoubtedly the upper portion of the esophagus is affected. The case is evidently one of malignant disease of the neck, affecting also the esophagus and larynx.

Although in a case like this there was absolutely no hope of a cure, we desired to give the patient the benefit of radium treatment, and began immediately. After two exposures, the patient could swallow easier. The voice gradually became stronger, and hoarseness finally disappeared. July 5th, the patient could swallow solids and felt better. July 15th, she complained of pain on the left side, and small ulcers were found, probably caused by the continued use of radium. It was therefore discontinued, and the ulcers as well as the pain disappeared in a few days. After that, however, she began to grow worse; fever set in and she discontinued treatment. In this case there is one point of importance, viz., the greatly improved facility of taking food. Before taking treatment the patient had swallowed food only with the greatest difficulty; but after its use she could take even solid food. The relief, however, was only temporary and the cancer ran its deleterious course.

One of the most striking cases on record is the one demonstrated by me before the Section of Laryngology of the New York Academy of Medicine, on October 23, 1907. The history of the case is as follows:

CASE 10. S. S., aged forty-eight years; peddler. Family history negative. Has never had any serious illness, never any venereal disease. Status praesens: About nine months ago the patient began to experience a pressure in his throat on the right side whenever he spoke. This increased and very soon the patient applied for treatment. On examining the throat, an irregular mass of tissue was observed, springing up from the right tonsil and extending from between the pillars of the fauces to the base of the tongue. It bled profusely when touched. The patient had some difficulty in swallowing, and felt pressure in his throat when speaking. His voice was muffled. There was absolutely no sign of any present or previous syphilitic affection. This was corroborated by a well-known dermatologist, who examined the patient several times. A microscopic examination of a piece of the tissue was made and the growth was found to be a roundcelled sarcoma. From the very first, the patient was given potassium iodide in ascending doses up to 80 grains, three times daily, and later on, inunctions. This was kept up for six weeks in order to positively eliminate the diagnosis of syphilis, but there was absolutely no diminution in the size of the tumor. On the contrary, it rapidly increased in size, so that the interspace between the pillars and the base of the tongue up to the median line was finally filled up by the mass, which was larger than a pigeon-egg. No view of the larynx could be obtained, as the mass concealed the entire epiglottis. As the antiluetic treatment showed no results whatever, the only thing left to do was to remove the mass by an operation, but as all my former cases of sarcoma of the tonsil had died very shortly after surgical intervention, I was not much inclined to have this patient operated upon, nor did he himself much care to undergo an operation. So we exposed him to emanations of radium for ten minutes at the first sitting, for twenty minutes at the second and later for thirty minutes, using 10 milligrams of radium, of 1,000,000 strength. From the moment the radium was applied the retrogression of the neoplasm was so striking that it could not fail to attract notice. I watched the case with my four assistants and a good many other colleagues who happened to visit the clinic. After the first application, a part of the mass sloughed away, and after 18 applications only a fragment remained. That also disappeared very soon, but we continued the seances in order to be positive. The patient was perfectly cured, and today, four years after the operation, is in good health.

Reviewing these cases and all the others treated with radium but not mentioned in this paper, one question is paramount, viz., What has been accomplished by radium?

Before answering this, some details of the treatment have to be mentioned. How are the neighboring parts protected?

I do not protect them at all, for several reasons. First, in these special parts—in the nose, nasopharynx and the larynx—every particle of space is needed, and it is impossible to cover the tube with extra sheets of tin foil or the like. Second, we may suppose that a malignant neoplasm affects also the neighborhood of the growth with which we have to deal. No deleterious effects have been observed from exposing the apparently healthy parts to the rays of radium, excepting occasionally an ulcer which healed quickly. The length of the exposure has been determined by the tolerance of the patient. Even in the pharynx many patients cannot at first hold the radium for more than a few minutes, and to hold it in the nasopharynx requires considerable intelligence and good will on the part of the patient.

Case 4 was almost forced by his wife to come for treatment, and it was difficult to make him hold the tube in his mouth. As he could not grasp the idea of our treatment, he once asked me: "It is not salt, it is not pepper; what is it?" On the other hand, Mr. P. (Case 5) managed to keep the tube in his nasopharynx for as much as two hours and a half. Of course, most patients are desirous of assisting the physician in that respect. A coughing spell or an irritation in the throat, however, may interrupt the treatment at any time, and it happens frequently. That is the reason why such odd times have been given above for the treatment—as twelve minutes, one hour and ten minutes, etc.

What dose shall be given? That depends upon the tolerance of the patient, as just mentioned, and on the reaction produced by radium. After a twenty minute exposure, the writer has seen an edema in the pharynx develop, so severe that there was some dyspnea noticeable. That disappeared under ice, etc., but it warned us not to be too bold in the beginning. The superficial ulcers occur, especially over the soft palate. They, too, heal rapidly, if radium is left off for a time. For these reasons we have to feel our way, and gradually grow bolder with the radium. The less the reaction, the more we push the radium. If, for example, it is applied on the outside of the neck and there should be a big tumor present, we may proceed more rapidly, all danger of an edema or dyspnea being eliminated. Case 4 thus carried the radium tube for 5 and even 6 days uninterruptedly!

The action of the rays of radium on malignant diseases, including tuberculosis of the larynx, seems to be of such a nature that granulations first spring up. These break down, and more or less pus is evacuated, leaving a large ulcerative area in its stead. This heals occasionally very soon, without even leaving a scar. That procedure we have noticed over and over again, and could only compare it with a gumma that breaks and disappears under K. I. This springing up of granulations, with or without edema, has caused the writer to give up radium treatment in almost all cases of intrinsic carcinoma of the larynx. Unless such a neoplasm be very small, no patient can hold the radium in his larynx long enough to produce an effect, while at the same time the danger of an edema, etc., is present. Under such conditions, it is more advisable and safer to do laryngectomy. That was done in the case of S. G. (Case 8), six years ago, and the man is still living. The plan the writer intends to pursue in the future in cases of intrinsic carcinoma of the larynx is to do thyrotomy, remove all diseased tissue and then apply radium. Or if thyrotomy should be rejected by the patient, an intubation tube might be constructed that would hold the radium in situ at the same time permitting free respiration.

The action of radium rays on the skin is somewhat different. It there produces excoriations, blisters, ulceration, necrosis, and finally cicatrization. In general, we may say that the local action of radium is one that retards the physiologic functions, and in large doses is destructive to the tissues.

What have been the results of our therapeutic efforts with radium?

The most gratifying results were achieved in epithelioma of the skin, but even in more malignant diseases the results are occasionally extremely satisfactory. Take, for example, the man with the sarcoma of the tonsil (Case 9). That patient was cured with very little effort—no loss of blood, no inconvenience; simply applications of radium and cure. That case shows brilliantly the best results obtained with radium, and proves that occasionally it is of invaluable service to us. But take some other cases, as that of the girl with sarcoma of the superior maxilla (Case 2), or Case 5, the tumor in the nasopharynx, etc. Are they not of enormous value to us? Do they not show us that some cases formerly considered hopeless, can be cured by radium? I say purposely some, because we can never tell beforehand whether or not a given case will yield to such treatment. For that reason it is our duty to try radium first.

Cases of very malignant cancerous growths have not been sufficiently tried to justify an expression of opinion, but it may be said generally that the more benign the disease the more readily it yields to radium treatment; the more malignant, the less.

In conclusion, permit me to state that every one of the cases reported in this paper have been seen and followed up by other physicians, and cannot be pronounced as colored by the writer's enthusiasm. The good results that we have obtained demonstrate that the scepticism of many physicians toward radium is unwarranted, and that radium will have, and has already taken, a place in our therapeutics.

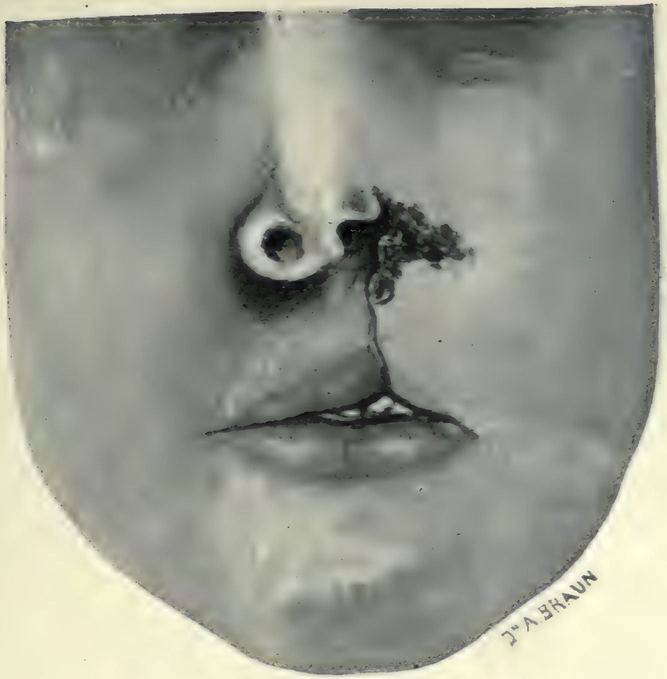


PLATE I.

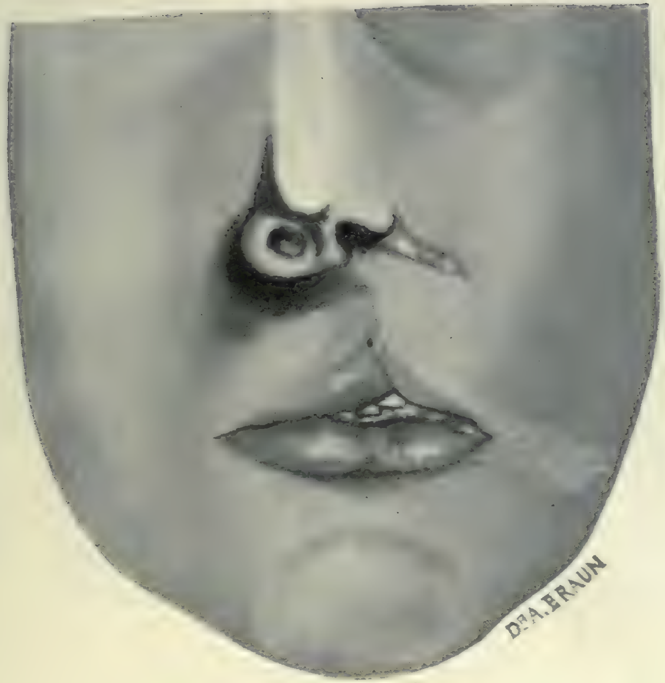


PLATE II.

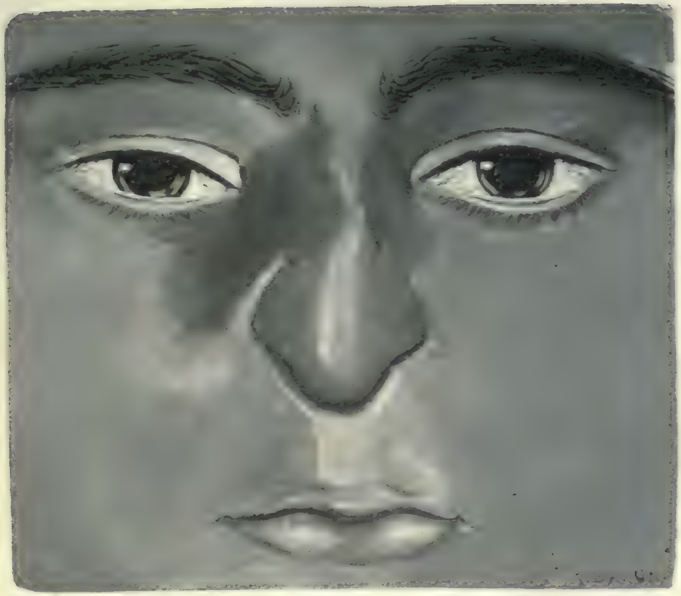


PLATE III.

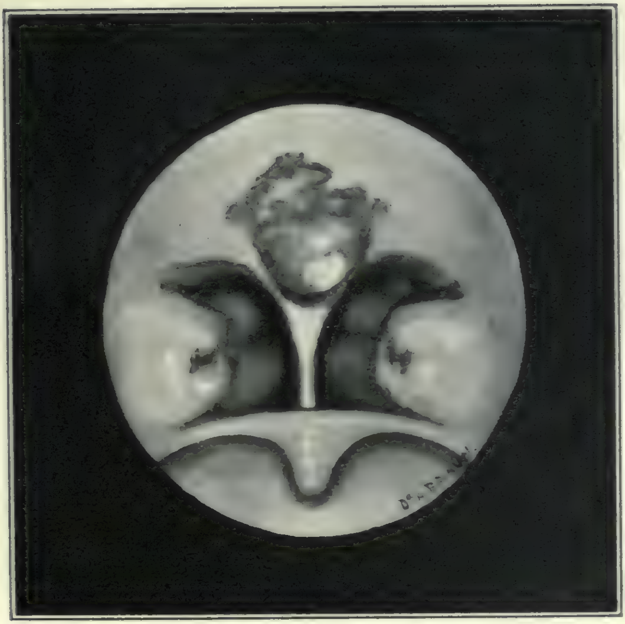


PLATE IV.

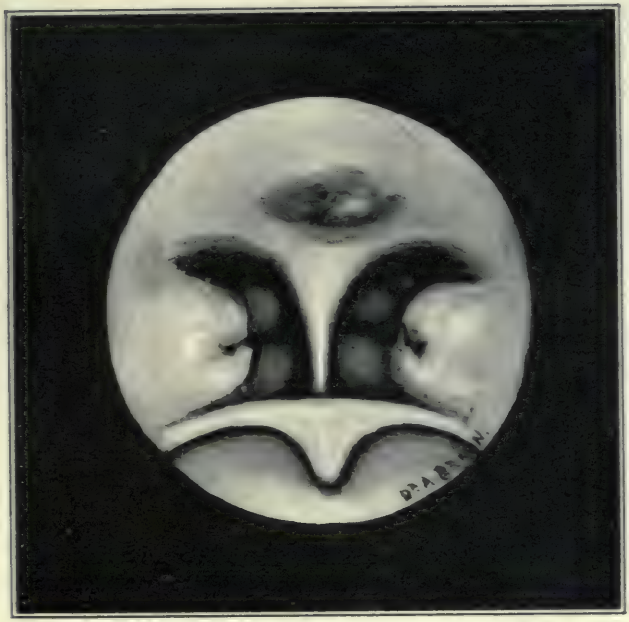


PLATE V.

II.

THE EXAMINATION AND TREATMENT OF THE NASOPHARYNX AND EUSTACHIAN TUBE BY AID OF THE NASOPHARYNGOSCOPE.

By E. M. Holmes, M. D.,

Boston.

It has been known for years that the great majority of ear diseases, both acute and chronic, originate in the nose and nasopharynx and extend from here through the Eustachian tube into the middle ear, and in many cases into the mastoid cells. Until now it has been very difficult to examine the posterior portion of the nose and the nasopharynx during life. It has been practically impossible to examine the Eustachian tube by vision, and direct examination of the tube has been possible only in the few cases of cleft palate, congenital or traumatic, and in cases where syphilis or trauma has destroyed the nasal septum and turbinates. In all of these cases we have a Eustachian tube which is subjected to unusual conditions and we cannot expect to find normal appearances.

The small mirrors for use behind the palate have been of service, but everyone who has used the postnasal mirror knows that in the most favorable cases it will not enable him to view the lumen of the Eustachian tube, nor can he see the movements in and about the tube during deglutition. In the majority of the cases the postnasal mirror gives only a poor picture of the deep recess of the fossa of Rosenmueller. It never, so far as I can learn, has shown the opening into the sphenoid cavity; and rarely indeed has it given any definite idea of the condition of the upper surface of the velum palati which is continuous with the floor of the Eustachian tube.

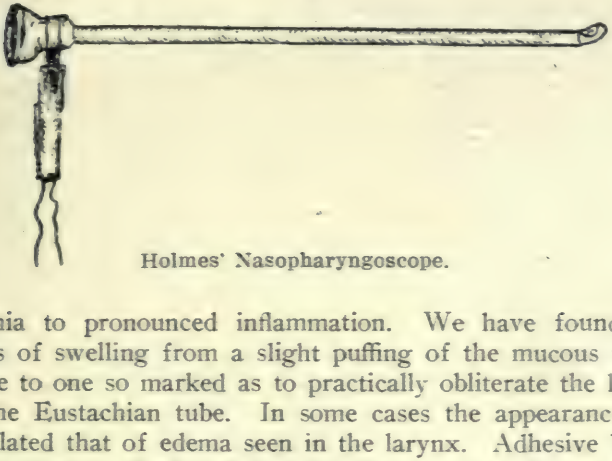
The various pharyngoscopes have given very distorted pictures and have been able to give these only from the same view-point as the postnasal mirror.

The examination of the nasopharynx, by some modification of the cystoscope, has been tried at various times by passing the tube of the instrument through the nasal cavity. All of these attempts have given little success in diagnosis, because, as far as I can find, none of the instruments were of proper construction for this special use.

Three months ago I began experimenting with the small female cystoscope. My aim was to use the scope in one side of the nose for inspection and to use the other side of the nose for passing operating instruments, hoping by these means not only to see diseased conditions in and about the Eustachian tube but by the guidance of vision to direct the instruments for their treatment. I at first met with the same poor results obtained by others. I found that with the instrument as then constructed I could get only a very imperfect picture of the Eustachian tube, if any at all, and in no case could I get a view of the fossa of Rosenmueller or of the posterior epipharynx. It seemed fully as important to be able to see the fossa behind the tube as to see the tube itself, and as the posterior superior wall of the epipharynx is the site of much of the adenoid tissue, that too is of importance.

By experiments upon the living and by measurements upon the cadaver I found that the fenestra of the instrument I was trying was too great a distance from the tip. The prismatic angle was not right and the lamp was too long. I therefore ground off 4/16 of an inch from the end of the lamp socket and deepened the socket an equal amount. I then had a short lamp constructed, and with these changes I had produced an instrument which would do all I had hoped for as far as inspection was concerned. I found, however, that the cystoscopic eyepiece and handle were too large to permit of easy manipulation of operative instruments which have to be passed through the opposite nostril and are therefore parallel to the tube of the scope. It was a simple matter to reduce the size of the frame about the eyepiece and to make a lighter handle. It was found that a prismatic lens could be placed nearer the tip of the instrument than the prism, and I therefore substituted this lens for the prism.

We have now an instrument which I have named the nasopharyngoscope, which weighs about one-half that of the small female cystoscope. It can be inserted through the nose into any nasopharynx into which we can pass a small Eustachian catheter, and by advancing and rotating the instrument when in place, we can examine the whole nasopharynx, the upper surface of the soft palate, the lumen of the Eustachian tube, the posterior portion of the nose and in many cases the opening into the sphenoid cavity. The field is sufficiently large to include the Eustachian tube, the space between the anterior lip of the tube and the turbinates and Rosenmueller's fossa, with its posterior border behind the tube. With this large field the nasopharyngoscope need not be moved while operating upon any area in or about the tube. The movements in and about the Eustachian tube during deglutition are observed and studied with perfect ease as the instrument causes no pressure upon the tube or any of the muscles which move it. We can distinguish all degrees of color from marked anemia to pronounced inflammation. We have found degrees of swelling from a slight puffing of the mucous membrane to one so marked as to practically obliterate the lumen of the Eustachian tube. In some cases the appearance has simulated that of edema seen in the larynx. Adhesive bands and growths in the lateral fossae are found and removed under the guidance of vision. I have removed one polypoid growth nearly as large as an orange seed which was attached to the floor of the Eustachian tube. It was so far within the tube that I could see it only by the aid of this instrument. The growth is now being examined by a pathologist and will be fully reported later. We have seen another lymphoid mass on the floor of a tube, but not so far within the tube as the one I removed.



Holmes' Nasopharyngoscope.

Before passing the nasopharyngoscope the nose is anesthetized with cocain. The tube of the instrument is then guided through the inferior meatus. It should rest upon the floor of the meatus at the side of the nasal septum. The fenestra is kept pointing upward until it has passed the posterior border of the septum when it is rotated toward the opposite side of the epipharynx from which it enters. This brings the Eustachian tube upon that side into perfect focus without distortion. By rotating the fenestra toward the side in which it enters, the Eustachian tube on that side can also be seen, but not as perfectly as the other. By directing the fenestra upward the roof and posterior wall of the epipharynx are brought into view, and when the window looks downward the upper surface of the soft palate is within the field. Behind the palate a picture of the larynx, reduced in size, comes into view. With the fenestra pointing upward and slightly withdrawn from the nasopharynx the posterior portion of the nose is brought into view, and in many cases the sphenoid opening can be made out. In several cases we have seen pus dropping through this opening.

For the treatment of the tube I have devised several applicators; one is of rather heavy bronze wire with a flattened tip to hold the cotton fibre when wound upon it. The other end is fashioned into a loop to fit the end of the thumb. This is enclosed within a vulcanite catheter, and when fully extended the tip of the wire is about one-half inch from the tip of the catheter. The cotton is wound about the tip of the wire, making the end olive shaped. This is soaked in any solution to be used and is drawn within the end of the catheter. Here it remains until the tip of the catheter has been carried to where we wish to make the application, when with the thumb the wire is advanced within the catheter and the application is made. By withdrawing the wire the cotton tip is again brought within the catheter and the whole can be easily removed from the nose.

Another applicator is made from a double heddle wire and is very light and flexible. The tip of this is fashioned like a flat hook. The cotton fibre is teased out and caught between the hook and body of wire; then very carefully wound so as to make a perfect olive tip. This cotton tip cannot be removed without burning or cutting and can be carried through the whole length of the Eustachian tube. In cases where there is stricture of the tube I employ what I have successfully used as a bougie for several years. It is made of steel piano wire and is so wound at the shank as to form a measure, so that it is possible always to tell the distance of the tip from the end of the catheter. The tip is fashioned similar to the applicator. If the cotton is well wound it forms a tip that conforms to the lumen of the tube at the point of stricture and here exerts a steady pressure, but without trauma if carefully used.

I have devised various curettes which can be used not only in the Eustachian tube but in Rosenmueller's fossæ. I have also made a universal forceps with cutting edge which is sufficiently strong to remove adenoid tissue, adhesion bands and mucous polyps from within and about the tubes.

After practice it is as easy to use these instruments under the guidance of the nasopharyngoscopic view as it is to operate in the larynx by the aid of the laryngeal mirror.

In the case of a badly deflected septum or large septal ridge it would of course be impossible to pass the operating instruments through the obstructed side, but in such a case some nasal operation would be indicated for reasons other than passing our instruments. After relief of the nasal obstruction such a case can be treated as any other.

During the past five weeks we have treated at the Boston Dispensary eleven cases of acute secreting inflammation of the middle ear with pronounced bulging of the membrane tympanæ by applying cocaine and adrenalin, followed by a 15 per cent solution of argyrol directly to the Eustachian tube. In only two cases did we fail to give relief. In one case the pressure was not diminished and we had to perform paracentesis of the membrane. In the other case there was temporary relief, but the patient did not return upon the following day, as she was directed. There was severe pain beginning the second night, followed by rupture during the night. In all of these cases applications were made under the guidance of vision and in a number of cases we could see secretion coming from the Eustachian tube after having used the treatment. The majority of the cases showed as marked relief as usually follows puncture of the drum membrane. Two of them were relieved by a single treatment, but in the majority of them we made at least four or five applications before the cure was complete.

In most of these cases the mucous membrane in and about the Eustachian tubes was much swollen and injected. It had much the appearance of the pharyngeal walls during an acute inflammatory process. There was also almost always the same excess of mucus and in some of the cases a purulent secretion was present.

We have relieved a number of cases of chronic middle ear inflammation. Several of these patients had been given general treatment for long periods with little if any relief. There were four in this class who were not given even temporary relief by inflation, but they made marked progress under treatment of the tube.

There was one woman who had suffered constantly with vertigo for ten months. It was at times very severe. The tests for labyrinthine disease were negative. The right membrana tympani was more hazy than normal. The left was considerably retracted and more opaque than the right. The hearing was

R	28	33	31	36	8	
	C	C^1	C^2	C^3	C^4	Web R< L
L	13	18	20	24	8	

The right Eustachian tube was apparently normal, the left tube was swollen and dark red in appearance. This patient gave a history of a number of inflations without apparent improvement. Like in many of the other cases we began treatment of the inflamed tube, but without much expectation of improvement. Every second day I made application to the tube by passing the cotton-tipped bougie soaked in argyrol. After five treatments, or at the end of ten days, the patient could walk and look down without being dizzy, and she has remained free from symptoms until now, a period of two weeks.

We have been treating a number of cases of old suppurative middle ear disease, but although several cases have shown improvement in the appearance of the Eustachian tube, we cannot feel positive of any improvement upon the suppurative process.

Dr. F. P. Emerson and Dr. H. J. Inglis have seen and, with me, watched the progress of most of the cases I am reporting, as all except one of them were Boston Dispensary patients. We have tried not to be influenced in our findings by too much enthusiasm; and by having two or more observe each case we have somewhat removed personal error.

We have been for so short a time applying treatment to the nasopharynx and Eustachian tube under direct inspection that we are not in a position to draw definite conclusions, nor have we time in this preliminary report to go into detail in these few cases we report. We realize it will take many months of study to learn some of the less marked pathologic changes found in and about the Eustachian tube, and the effect of these conditions upon the middle ear. It will also require the careful study of a large number of cases before we can know the best methods of treatment, and with such treatment the probable prognosis. The most important of all are the final results upon the middle ear complications. For the symptoms of nasopharyngeal and Eustachian diseases are of little importance when compared with those of middle ear disease.

What we can do is to see with the eye the condition of the whole epipharynx and Eustachian tube and to treat the pathologic conditions found both medically and surgically under the guidance of vision.

The past six weeks' experience at the Boston Dispensary and with our private patients has convinced us that much can be accomplished.

How much remains for all students of rhinology and otology to help us demonstrate.

Drawings made of cases seen at the Boston Dispensary:

1. Normal tube.
2. Adenoid tissue in Rosenmüller's fossa.
3. Inflamed tube nearly closed lumen.
4. Polypoid growth attached to the floor of the tube.
5. Granular tissue (probably adenoid) extending over cushion and int othe lumen of the tube.
6. Bands in Rosenmüller's fossa.
7. Posterior end of lower turbinate resting upon anterior lip of tube.
8. Marked inflammation of tube (strawberry appearance).
9. Nasopharyngeal growth pressing upon posterior wall of tube (symptoms of tinnitus and dizziness for three months).
10. Very large adenoid in 7-year-old boy.
11. Pus coming from right sphenoid cavity.

12. Band running from posterior border of septum and joining anterior lip of the tube.

13. Tube lacking the usual cushion floor.

14. Bands across Rosenmüller's fossa.

15. A much swollen tube in a case of acute purulent otitis media.

16. Posterior turbinates, two openings in superior meatus.

17. Very patulous tube. Contact between anterior lip of Eustachian tube and inferior turbinate.

18. Growth low down in Rosenmüller's fossa.

19. Pus dropping from mouth of tube in a case of chronic mastoiditis.

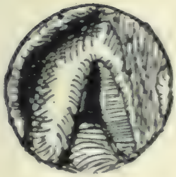
20. Lymphoid mass nearly filling fossa and covering cushion of tube.

21. Polyps at posterior end of middle meatus.

22. Large polyp in epipharynx covering tube.

23. Right tube in case of sagging right membrana tympani.

24. Left tube in same patient as 23. The left ear was normal.



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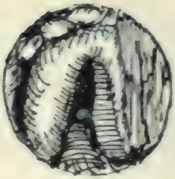

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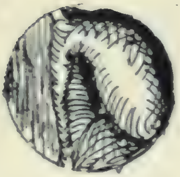

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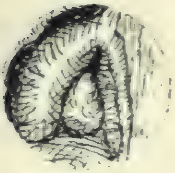

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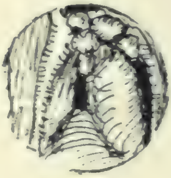

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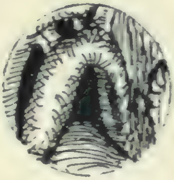

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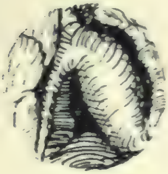

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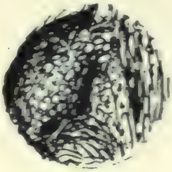

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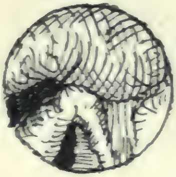

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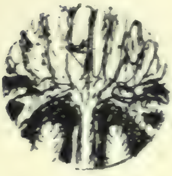

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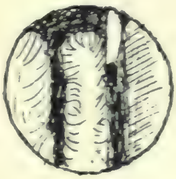

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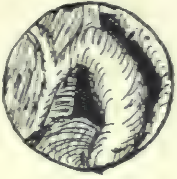

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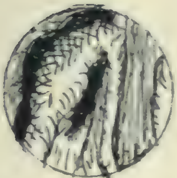

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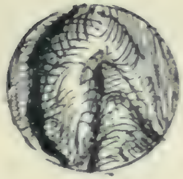

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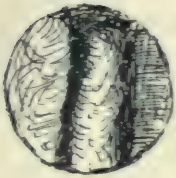

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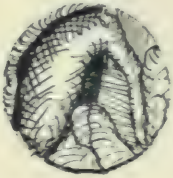

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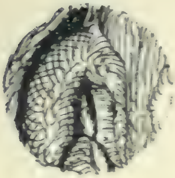

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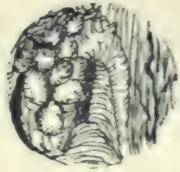

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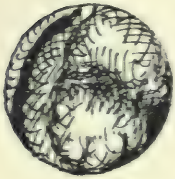

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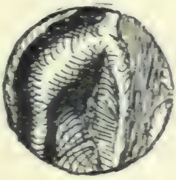

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III.

THE ELECTRIC NASOPHARYNGOSCOPE.

By Francis P. Emerson, M. D.,

Boston.

Through the kindness of Dr. Holmes I have had the opportunity of using the nasopharyngoscope in my office daily for a month, and with him have observed and can verify his findings, in the cases reported from the clinic. Briefly summarized we can determine the following:

First. The condition of the mucous membrane, *i. e.,* (a) atrophy, (b) hypertrophy, (c) congestion, (d) enlarged blood vessels, (e) secretion.

Second. Conditions of Rosenmüller's fossae that cannot be detected by the posterior mirror or the finger.

Third. The mobility of the Eustachian tube and the changes within its lumen for approximately five-eighths of an inch, as well as conditions anterior to the Eustachian eminence.

Fourth. The size and appearance of the posterior ends of the middle and inferior turbinates and the lateral walls of the posterior nares.

Fifth. In about 40 per cent of the cases the sphenoidal opening, with occasionally a posterior ethmoid cell.

Sixth. Lateral enlargements of the vomer.

Seventh. The interior of the larynx (although this is more difficult and less satisfactory).

Eighth. The posterior pharyngeal wall.

In 1907 the writer stated in a paper published in the Annals of Otology, Rhinology and Laryngology, that, given a case of unilateral deafness with fluctuating hearing, recurring salpingitis and tinnitus, there were always pathologic conditions in the fossa of Rosenmüller. This we have verified, and also that the congestion passes over into the Eustachian tube, particularly along its posterior-superior and superior walls.

In an angular fossa there may be bands and considerable tissue that cannot be detected by the finger, or lymphoid tissue may hang over into the lumen of the tube. Such conditions may hold the tube as in a vise. On the other hand, the wide excursion of the tube, when free, during deglutition is very striking. The changes in the tube, even in catarrhal adhesive ears, with progressive deafness, and with no symptoms of nasopharyngeal catarrh, have been almost constant.

In suppurative otitis media and chronic secretory ears, this condition has varied from congestion of the upper lip to actual edema. Within the tube the membrane may present localized or general congestion, atrophy or hypertrophy. Bands or polypi may be present. The lumen may be filled with serum, mucopurulent or purulent secretion, or its walls encroached upon from the fossa of Rosenmüller or the posterior ends of the turbinates. In one case a woman of 65, the duration of whose symptoms extended over a period of years, during which she was regularly catheterized, clear pus in considerable quantity was discharging through the tube. Very active and constant factors in keeping up a salpingitis outside of focal suppurations have been the glandular ends of the turbinates, which may be discharging directly into the open tube. These hypertrophies may extend into the nares and their size cannot be determined by posterior rhinoscopy as they are clearly seen with the nasopharyngoscope.

The writer believes this instrument to be a valuable addition to our armamentarium, not in the treatment of the exceptional case, but in the daily routine of office work, and that chronic infection of the Eustachian tube must be regularly sought and treated as part of the care of the nasopharynx in progressive deafness.

IV.

HISTORY OF A CASE OF CEREBELLAR ABSCESS PRESENTING CERTAIN FEATURES SUGGESTIVE OF LABYRINTHINE SUPPURATION; DIFFERENTIAL POINTS; OPERATION; RECOVERY.

By Philip D. Kerrison, M. D.,

New York.

The following case is reported on account of certain clinical features which should interest equally the otologist and the neurologist:

L. A., a girl of 16 years, had suffered from bilateral suppurative otitis media since early childhood, both drum membranes being practically destroyed. She had experienced the usual infectious diseases of childhood, the past history being otherwise negative as to conditions bearing upon the aural lesions.

On February 9th, 1910, when first seen by the writer, she presented, in addition to the symptoms characteristic of chronic bilateral middle ear suppuration, the physical signs of an acute inflammatory process involving the right mastoid. Her temperature at this time was 100.4° F. She gave a history of having been dizzy at times during the past three or four days, but showed no disturbance of static equilibrium, and walked with normal ease. She exhibited at this time moderate physiologic nystagmus when the eyes were rotated to the extreme lateral position in either direction. She complained chiefly of pain referred to the right mastoid, which also was exquisitely sensitive to pressure. The patient presented the appearance of greater illness than is usual in cases of mastoiditis of average severity. She was, therefore, admitted to the Manhattan Eye, Ear and Throat Hospital and prepared for immediate operation.

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*Read before the Section on Otology, New York Academy of Medicine, November 11, 1910.

Operation, February 9th, right mastoid. Removal of the cortex disclosed a diploeic mastoid in the acute hemorrhagic stage of inflammation. But little fluid pus was found, elsewhere than in the antrum, until the sigmoid sinus was exposed, when a small perisinous abscess was encountered. The sinus was uncovered over about three-quarters of an inch of its length. The mastoid cells were next converted into one cavity by removal of the posterosuperior wall of the bony meatus, and the bone operation completed by the steps usually followed in a radical mastoid operation. Owing to the finding of pus in contact with the sinus wall, the posterior wound was left open.

During the four days following the operation the patient seemed to be free from pain or discomfort. She slept well at night, took the usual amount of nourishment and presented the appearance of a patient reacting favorably after operation.

On February 14th and 15th (fifth and sixth days after operation) she complained of headache and slight dizziness. Examination of the eyes showed absolutely no nystagmus when the patient looked directly in front of her, but moderate rotary nystagmus when the eyes were voluntarily rotated to the extreme lateral position in either direction; the quick eye movement always changing to correspond with the direction in which the eyes were turned. In type it corresponded to the so-called physiologic nystagmus. During this time the temperature ranged near the normal line, with two moderate rises, the highest being 101° F.

On February 17th, two days later, she complained of severe frontal headache and had one attack of unexplained vomiting.

During the next three days the temperature remained practically normal, and the patient, though complaining of moderate headache, seemed in good condition.

On February 20th, while dressing the wound, I applied the caloric test, using first cold and then hot water, and obtained not the slightest reaction. The hearing, however, carefully tested with the aid of the Barany noise instrument, proved surprisingly acute.

On February 23rd, the patient complained of severe frontal headache and dizziness, and had one attack of vomiting, unaccompanied by nausea. She still exhibited rotary nystagmus when the eyes were turned strongly in either lateral direction, but the nystagmus to the right was now altogether stronger and more prolonged than that following voluntary rotation to the left, which lasted but a few seconds. From her statements, even the strong nystagmus to the right seemed absolutely without influence upon her subjective symptoms. Getting the patient to stand, for the purpose of testing her static equilibrium, her subjective vertigo was increased and, had she not been supported, she would have fallen to the right. This reaction was frequently retested throughout her illness, and was constant—i. e., she fell, or without support would have fallen, always to the right. Lying in bed she now exhibited well-marked incoordination ataxia of the right hand, as shown by the difficulty in bringing her right forefinger promptly and accurately to the tip of her nose. It was about this time that she developed a peculiar speech defect, or lisp. Her mentality throughout the disease was perfectly clear, and she showed always rather unusual command of the right words to express her meaning, but the words themselves came slowly, thickly and with effort. She was herself conscious of this defect, commenting upon her difficulty in bringing the words out.

On February 28th, when Dr. Zabriskie kindly examined the patient with me, her condition presented the following additional features, showing disturbed orientation or muscle sense in the right side of the body:

Winking: Patient can wink both eyes. She can also wink left eye singly, but she cannot wink right eye alone. When she tries, always both eyes wink.

Rotation of wrists: Told to rotate both wrists as rapidly as possible back and forth, she performs what to the normal individual is rather a difficult feat—i. e., the left wrist rotates quickly while the right rotates very slowly—the left wrist executing about four rotations while the right rotates once.

Piano playing: Practicing the finger movements upon a book, her left fingers move rapidly, as with any normal person, the right following with similar movements, but very slowly.

Trying to touch the tip of her nose alternately with right and left forefinger, the left forefinger is brought to the nose with quickness and precision; the right only after a series of to-and-fro oscillations in the vicinity of the face.

The effort with eyes closed to bring the tips of the right and left forefingers together, gave the following results: Holding the right forefinger stationary above her chest, she had no difficulty in bringing the left into quick and accurate contact with it. Reversing this—i. e., holding the left forefinger stationary—she could bring the right forefinger into contact with it only after a series of to-and-fro oscillations in its immediate vicinity.

On March 3rd the eyes were examined for fundus changes by Dr. Wootton, and found normal.

Analysis of Symptoms.—To epitomize, the important symptoms in this case were: Subjective vertigo; rotary nystagmus corresponding to the direction in which the eyes were turned, but stronger and more prolonged to the right; loss of caloric irritability in the right ear; disturbance of static equilibrium, the patient falling always to the right; and evidences of disturbed arthrodial and muscle sense in the right side of the body.

Three of these symptoms—viz., the vertigo, nystagmus and loss of caloric irritability—while in some respects atypical, suggested the possibility of a labyrinthine lesion. It seemed possible that certain contradictory features might be the result of a double lesion—i. e., an infection reaching the cerebellum by way of the labyrinth. Such a diagnosis, if confirmed, would have called for an operation upon the labyrinth as well as upon the cerebellum.

Disease of the labyrinth was at length definitely excluded, upon the following grounds:

1. A suppurative lesion of the labyrinth of sufficient severity to annul caloric irritability would almost inevitably have involved the cochlea and produced deafness, usually profound. The hearing in this case was remarkably good.

2. A suppurative lesion of the labyrinth causing loss of caloric reaction would give rise to rotary nystagmus toward the opposite ear. In this case the nystagmus was most pronounced and prolonged toward the diseased ear.

3. With nystagmus to the right, caused by a labyrinthine lesion, the patient would have fallen to the left. This patient fell invariably to the right.

4. With active nystagmus and vertigo resulting from labyrinthine disease, the direction in which a patient falls is always influenced by the position of the head. This patient fell to the right, irrespective of the position of the head.

Labyrinthine disease having been definitely excluded upon the above considerations, the diagnosis of cerebellar abscess seemed fairly positive.

Second operation, March 6th, 1910. The wound resulting from the first operation was at this time filled with firm and apparently healthy granulations. This granulation tissue was carefully removed with a curette, and the wound again reduced to the condition of the primary operation at the time of its completion. The exposed sigmoid sinus was again outlined. The anterior aspect of the cerebellum was next uncovered by the removal of bone in front of and internal to the sinus. This when completed exposed a triangular surface of cerebellar dura, bounded above by the tegmen antri, and in front and behind by the petrous bone and sigmoid sinus respectively. The wound was now resterilized and an effort made to reach the abscess through this exposure. A narrow blade knife was introduced in two directions—first inward and slightly backward, and then in a more backward direction—but failed to reach the abscess. This wound was therefore lightly packed with sterile gauze, and an exposure of the occipital surface of the cerebellum made by the removal of bone behind the sinus. In this way a dural surface of the size of a silver dollar was uncovered. The second incision of this exposure—the knife being carried inward and forward—was followed by the escape of about a dram and a half of fluid pus.

No effort was made to further explore this tract. The encephaloscope was not used. The knife was held in position slightly rotated until pus ceased to flow, and a small wick of folded sterile gauze was then introduced in the direction in which the knife had passed. Application of a large dressing of sterile gauze completed the operation.

The favorable influence of this operation upon the patient's condition was almost immediate. The following bedside history note by Dr. Moore, the house surgeon, made on March 8th, two days after the operation, describes the rapid relief of symptoms: "Patient comfortable; no nystagmus; absolutely none with eyes turned to right; a few quick movements follow rotation of eyes to left. There is no incoordination ataxia in movements of right hand—i. e., she can bring right forefinger to nose about as quickly as left."

During the postoperative period the wound was dressed daily. Though the change of dressing was on one occasion attended by a flow of a half dram of pus, no effort was made to introduce a wick or drain to the bottom of the abscess cavity, the effort being simply to keep open, without injury or infection of the dural or cerebellar tissue, the pathway of escape already established. I believe that persistent adherence to this plan was an element influencing the successful issue in this case.

The temperature chart is omitted for purposes of brevity. The temperature curve was of a type so often seen in abscesses of the brain—going occasionally a little below the normal line and occasionally somewhat above it. The highest recorded temperature either before or after the operation was 101.4°F.

The patient was discharged as cured on May 10th. So far as I know, this is the only recorded case in which a cerebellar abscess was the direct cause of a loss of caloric irritability. The caloric test was repeated in August last, and there was no return of vestibular irritability. The hearing was still surprisingly acute.

58 West 56th Street.

V.

A REPORT OF A FEW CASES OF OTITIS MEDIA SUPPURATIVA TREATED WITH SUSPENSIONS OF LACTIC ACID BACILLI.*

By W. H. Haskin, M. D.,

New York.

Early in 1909 the writer became much interested in the many reports of the successful use of these suspensions in many diseases of the nose and decided to try their effect on some very intractable chronic suppurations in ears which had not responded to other methods of treatment and yet would not submit to operation. My associate, Dr. Dwyer, had made many examinations of smears and cultures to try to isolate some one characteristic bacterium, or even group of bacteria, in order to make a suitable vaccine with which to treat them.

This proved to be impossible, as many of the worst cases did not show the presence of bacterial growth. In others streptococci, staphylococci, diplococci, pneumococci, etc., were found and many other germs also, but none could be said positively to be the actual cause of the suppuration. It was noted that the bacillus pyocyaneus was frequently present.

The paper of Dr. C. E. North gave so many reports of cases benefited by this treatment, I wrote to Schieffelin & Company, and they very kindly furnished me ample supplies of massolin, which they described as: "A pure culture of the bacillus bulgaricus (a lactic acid producing bacterium described by Massol) in a medium adapted for introduction into the nose and throat. Indicated in the treatment of suppurative conditions."

As it is a well known fact that the growth of the lactic acid bacillus in culture media will destroy the growth of a great many putrefactive and pathogenic bacteria, we decided to try it, as there could be no harm done. The results have been so marked in most cases, it may prove interesting to report a few of them that we were able to follow. Some cases did not show improvement, but we felt that the instructions had not been carefully followed out, because the majority showed such marked improvement. The majority of the patients on whom we used massolin were what might be said to be exaggerated cases, several having been assigned to me with their cards marked for probable radical operation. They included cases with polypi, perforations with edges granulating and very thickened mucous membranes throughout the tympanic cavity, caries of the ossicles and of the attic wall.

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*Read before the Section on Otology, New York Academy of Medicine, November 11, 1910.

We used it also in several cases of acute suppuration, using no douching, merely wiping the canal dry and then applying a cotton tampon saturated with the culture every two or three hours, and the results have been excellent.

We have applied it in several cases on whom radical operation had been performed, but there still remained a most offensive secretion. As we have not had the clinic cards of these patients, we have, unfortunately, no records of these cases other than memory, but we feel that no other treatment has given the same amount of benefit to them than the proper use of this culture.

The writer does not pretend that this is a cure-all, but earnestly recommends its trial in a great many cases, even of acute cases, and especially in private practice where one can secure its proper administration. The success of this treatment depends upon a free use of the solution, which should be given ample time to insure contact with the diseased area, at least fifteen minutes being none too short a time. This cannot be obtained by merely swabbing the canal. As Dr. Holbrook Curtis says, there seems to be some substance in the solution which acts upon the vasomotor system and reduces turgescences and even hypertrophies in a marked manner, as has often been noted in affections of the nose, such as acute colds and hay fever. The writer believes that this action is due, not to the lactic acid produced by the growth of the bacillus in its culture media, as suggested by Dr. North, but to the presence of an enzyme, this being produced by the growth also.

When one notes the rapid change for the better which so often occurs, the disappearance of the odor, the restoration of membranes to a healthy condition and the cessation of discharge, is it not well to give the patient the opportunity of trying this treatment before resorting to the heroic radical operation, with its risks, and frequently unsatisfactory end results, especially on hearing?

Granting that the discharge may return, this is generally due to a secretion from the eustachian tube which the operation recently described by Dr. Sidney Yankauer will probably cure better than any method yet attempted. The treatment of the eustachian tube is so frequently neglected in these cases, the writer would suggest that medicaments may easily be driven through the tube by means of the Siegle otoscope and great relief be promptly obtained in many of them.

As I have stated before, in order to secure results a reasonable length of time should be allowed for the solution to exert its influence and a sufficient quantity should be used. The following instructions should be given to the patients and explained to them: First, to syringe the canal carefully with a warm saline solution and wipe dry. The patient should then lie down with the diseased ear up and the canal be filled with the solution, which should be left in the ear for at least fifteen minutes before wiping it dry. When this method has been carried out, at first twice daily and then once a day, there has invariably been marked improvement in a few days' time. Simply swabbing the ear does not produce the results expected, which leads one to wonder whether it is not true that the enzyme produced by the growth of the bacillus does actually play a very important part in securing the benefits derived from the solution.

It is also important that fresh cultures be used in order to get the active bacillus. If left too long the growths appear to kill themselves and then the enzymotic action will not be present, nor will you have the activity of the growing bacillus and no results will be obtained. These cultures can readily be made in any laboratory and should easily be obtained.

40 East 41st Street.

se	Duration	Condition	Previous treatment	Massolin	Results
C. (B)	2 yrs.	Very offensive, profuse discharge.	6 mos. No benefit	2- 4-10	5 visits. Ears dry and no odor.
C. (S.)	years	Polyp. Offensive secretion.	Removed polyp. No benefit from previous treatment.	2-23-10	2 weeks. Ear dry and no dizziness.
al	O. M. P. C. Op. 4 mos. ago	Cavity full of offensive secretion with granulating surfaces.	8-15-10.	8-15-10	3 weeks. Ear clean and dry.
C.	3 yrs.	Free and foul discharge. Mastoid tenderness.	No benefit.	4- 6-10	Much improved on 3rd visit. Disappeared.
C.	15 yrs.	Drum destroyed. Foul secretion. Mastoid tender.	....	12-20-09	2 weeks. Ear dry, no tenderness or odor.
A.	2 wks.	Small perforation. Membrane red and thick. Profuse pus.	....	11- 9-09	Marked improvement in 4 days. Then disappeared.
C. (S.)	12 yrs.	Polyp. Offensive discharge.	No benefit.	3-18-10	Oct. 27-'10. Ear has remained dry. Polyp gone.
C.	2 yrs.	Profuse, offensive discharge. Mastoid tenderness 5 days.	....	8- 9-10	Seen only 3 times. Pain gone. Much better.
D.	years	Large polyp. Excessive foul discharge. Radical advised.	No improvement.	12-15-10	Removed polyp. Wrote Oct. 27-'10. Much better, no discharge. Hearing bad.

C.	years	Offensive secretion.	No. benefit.	12-20-09	Ears so much improved in 2 weeks he ceased coming.
A.	1 wk.	Pain and bloody discharge. Small perforation.	....	12-29-09	One week. Ear dry and no pain.
C.	13 yrs.	Granuloma. Offensive pus. Pain at intervals. Radical advised.	....	12- 6-09	Odor ceased in 2 days. Nov. 1-'10. Slight tubal secretion, otherwise well.
C.	3 mos.	Profuse discharge.	No. benefit.	12-19-09	Under treatment 2 weeks. Wrote Oct. 8-'09, ears well.
C. (l.)	6 mos.	Foul free discharge. Radical advised.	No benefit.	11- 8-09	After 10 days, odor and discharge ceased and membranes appear healthy.
. C. (l.) radical	8 yrs.	Both cavities foul.	No benefit.	....	No benefit.
. A. d	3 days	Severe pain. Discharge. Mastoid wound very painful.	Ice coil and hot douche gave no relief.	10-16-10	Ear improved immediately and was well in 3 days. Patient left hospital.
d on	1½ yrs.	Deep wound has never entirely healed.	No benefit, although treated for 1½ years.	10-14-10	In four days wound absolutely dry and clean. Epidermization complete.

VI.

A CONSIDERATION OF THE PATHOLOGIC CONDITIONS OF THE EAR RESULTING IN PROFOUND IMPAIRMENT OF HEARING.*

By Edward Bradford Dench, M. D.,

New York.

A profound impairment of hearing either may occur at birth or may be the result of some pathologic condition occurring after birth. This pathologic condition occurring after birth may be either hereditary or acquired.

It is impossible, in the short time at my disposal, to go very deeply into the histologic conditions which are found in the labyrinth in cases of those profoundly deaf. As I have done no original work in this line, I should simply be quoting from other observers, and it is much better for me to refer my hearers to the classical work of Denker ("Die Anatomie der Taubstummheit," Wiesbaden, 1904-1909), than to attempt to give here a resume of their work. What I shall attempt to do, in the time allotted to me, is to bring out a few points which may be of clinical importance, and to dwell very lightly upon the exact pathologic changes which occur in these cases.

In those who are born deaf it seems probable that intermarriage is one of the most common causes of congenital impairment of hearing. This impairment may appear in the first generation or may skip one generation and appear in the next. Consanguinity has, however, for a long time been recognized as a common cause of congenital deafmutism. In some of these congenital cases we have extreme deformity of the external ear, absence of the external auditory meatus and, in some cases, malformation of the tympanic cavity. The labyrinth is found poorly developed, the cochlea being incomplete in some of its portions. Partial or complete obliteration of the semicircular canals may also occur. In another class of cases of those

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congenitally deaf, we find faulty mental development. Faulty mental development, however, by no means occurs in the majority of cases of congenital deafmutism. Many of these patients are bright, mentally, and their sole defect seems to be their impairment of hearing. Among acquired conditions, meningitis in early life is, perhaps, the most common cause of deafmutism. Syphilis also plays a part, not only in the congenital form, but in the acquired form of those profoundly deaf, although it is probable that a specific taint is much less commonly a causative factor than was formerly supposed. A suppurative inflammation of the middle ear sometimes leads to profound deafness. To this variety belong those cases of panotitis, of the older writers, in which, as the result of a suppurative process, usually following one of the exanthemata, not only were the structures within the middle ear largely destroyed, but also portions of the labyrinth as well. Profound impairment of hearing, however, as the result of suppurative middle ear disease, is not of very common occurrence. Labyrinthine hemorrhage may also cause a profound impairment of hearing. This condition either may result from traumatism or may be dependent upon a degeneration of the walls of the labyrinthine vessels, due to an arteriosclerosis or to specific disease either of the hereditary or acquired form. Of the conditions which cause profound deafness in adult life, probably invasion of the labyrinth secondary to or coincident with middle ear disease, is the most common. I here refer to cases of otosclerosis.

With reference to otosclerosis, it seems to be a mooted point at present, as to whether the labyrinthine changes in this disease, occur per se, or whether they are secondary to middle ear involvement. I am well aware that many consider otosclerosis a condition which develops simultaneously in the labyrinth and in the middle ear, and that the labyrinthine affection is never dependent upon middle ear involvement. From a clinical point of view, I am hardly ready to accept this statement. I am inclined to believe that in quite a large proportion of cases the labyrinthine changes are secondary to the pathologic conditions within the tympanic cavity.

When we come to the consideration of the pathologic conditions which are present in cases of profound impairment of hearing, we may divide them into cases in which middle ear changes are present, cases in which labyrinthine changes are present, and cases in which changes in the auditory nerve trunk occur.

The changes which may occur in the middle ear, in the congenital conditions and in many of the acquired conditions, are, first changes in the ossicular chain. We may have a rigidity of the ossicles, this rigidity usually occurring as the result of an osseous deposit in or about the oval window or in the niche of the round window. More rarely, we have fixation of the incus, as in the case reported by Nager ("Anatomie der Taubstummheit," Dritte Lieferung, Wiesbaden, 1906), in which there was a synostosis between the incus and the internal wall of the middle ear.

Similarly, Alexander and Neumann ("Die Anatomie der Taubstummheit," Sechste Lieferung), report a case of deafmutism in which the tympanic cavity was practically obliterated by a new bony growth. In this case, there were also extensive changes, both in the cochlea and in the auditory nerve. In this case, also, the hammer, anvil and drum membrane were entirely wanting, and the stapes was rudimentarily developed. In the cochlea there was a new deposit of bone in the perilymphatic spaces and also in the vestibule. There was a new deposit of connective tissue and of bone in the cochlea. There were also changes in the aqueductus cochleæ, and in the utricle and saccule. There was also degeneration of the auditory nerve, both in its vestibular and cochlear branches. The changes occurring in the middle ear and labyrinth, in the congenital cases, may perhaps be somewhat understood by this report of the case of Alexander and Neumann.

A careful study of the cases in Denker's masterly collection of monographs on the subject of deafmutism, shows that in all cases of this character, extensive changes have been found in the cochlea and in the auditory nerve trunk, together with certain changes in individual cases, in the middle ear. It is a notable fact that in every instance where extensive changes have taken place in the end organ of the auditory nerve, the auditory nerve trunk itself has shown pathologic alterations either in the cochlear or vestibular portion, or in both.

The changes which occur in the middle ear may be either a faulty development of the ossicles or adhesions between the ossicles themselves, or between the various elements of the ossicular chain and the adjacent tympanic walls. Again, we may have the deposit of new bone in the middle ear, this occurring usually in the neighborhood either of the oval or round window, preferably in the former location. Such a deposit of new bone leads to fixation of the stapes and causes impairment of hearing on account of the inability of the ossicular chain to transmit sonorous vibrations to the column of fluid in the labyrinth. In certain cases, particularly in otosclerosis, this deposit of new osseous tissue is not confined to the outer wall of the labyrinth, that is, to the middle ear, but we find a deposit of newly formed osseous tissue both in the vestibule, the cochlea, and in the semicircular canals. Such a deposit of new bone gives rise to various symptoms, according to the location of the deposit. In otosclerosis, as this newly deposited bone occurs most frequently in the neighborhood of the oval window, the earliest symptoms of the disease are characterized by evidences of rigidity of the ossicular chain. Low tones are poorly perceived, bone conduction is increased, and as soon as the newly formed bone has been deposited within the labyrinth, the upper tones are usually poorly perceived. This for the reason that, owing probably to the free circulation in the lower turns of the cochlea, in contradistinction to the relatively poor vascular distribution in the upper turns, the newly formed bone is deposited most frequently in the lower cochlea turn, which is concerned in the perception of the higher tones of the musical scale. The regular occurrence of this symptom, in cases of socalled progressive deafness (or otosclerosis), seems to me to be a strong argument in favor of the supposition that the labyrinthine changes may really be secondary to changes within the middle ear, and that were appropriate treatment applied sufficiently early to the middle ear condition, the subsequent cochlear or vestibular condition might not take place. In a certain number of cases that have come under my observation, such treatment has been absolutely futile. In other cases, where there has been abundant evidence that such changes were beginning, local treatment has certainly retarded the progress of the condition.

In certain of the cases of otosclerosis, disturbances of equilibrium may occur. I have seen a number of cases of this kind. One was relieved by removal of the membrana tympani, malleus and incus, with partial liberation of the stapes, while a second was relieved by simple treatment of the middle ear condition by means of regular inflation. In the first case the symptoms were evidently due to an increased labyrinthine tension, caused by a deposit of newly formed osseous tissue, probably in the vestibule. In the second case, the labyrinthine changes were probably merely vascular in nature, and dependent upon an underlying middle ear condition.

While profound deafness, as the result of a suppurative inflammation of the middle ear, is comparatively uncommon, certain of these cases do occur. In the more advanced cases destruction of the labyrinth has undoubtedly taken place as the result of the suppurative inflammation. The avenue of invasion here is most commonly through the horizontal semicircular canal, although the oval and round windows are occasionally avenues of infection. These cases, following suppurative otitis, are usually characterized by some disturbance of equilibrium during some stage of the disease, in addition to the great impairment of hearing, so that, it is only fair to assume that the laybrinthine involvement is fairly extensive.

In some of these cases, however, the cochlea alone is apparently involved. Thus, in one case of double suppuration, in which the loud voice was heard only eighteen inches from the ear—maximum—there was no disturbance of equilibrium, and the rotation test showed a normal vestibular reaction. In cases of this character, the invasion must attack simply the cochlea, while the static portion of the labyrinth remains unaffected. In other cases, however, the entire labyrinth is involved, as evidenced by profound deafness and the failure of the static labyrinth to react to the rotation tests.

A labyrinthine condition which is sometimes seen after the radical operation, and which is probably best described as a perilabyrinthitis, may explain the impairment of hearing in a certain number of cases of chronic suppurative otitis, and may, perhaps, furnish us a suggestion as to the possible benefit of operative treatment in cases of this character. In a number of cases of suppurative otitis which have been subjected to the radical operation, the patients have, at varying periods after the operation, developed a nystagmus on looking either to the affected side or to the opposite side. This nystagmus has varied from day to day, sometimes more pronounced in one direction, sometimes more pronounced in another. Disturbances of equilibrium have occurred during the period in which the nystagmus was present. All the symptoms have subsequently completely disappeared without operative interference. In these cases, Neumann has made the suggestion that an inflammatory process is taking place in the soft bone overlying the labyrinth capsule. In my own experience, these symptoms have always appeared in cases in which the caries has been so extensive as to necessitate the removal of the bone to the very limits of the labyrinth capsule. It seems to me possible, in certain cases of profound impairment of hearing following middle ear suppuration, that this perilabyrinthitis may be responsible in some instances for the impairment of hearing, and that by resorting to the radical operation and removing the diseased bone, a certain recession of the labyrinthine deafness may be looked for.

My observations upon cases of this character are of comparatively recent date, and no report can be made concerning the results of operative treatment at the present time. It seems fair to assume, however, that in a certain proportion of cases in which profound impairment of hearing follows extensive middle ear suppuration, suppurative process has invaded perhaps not the labyrinth itself, but simply the perilabyrinthine structures.

Whether, in these cases, a serous labyrinthitis results, we cannot say. From the fact that a certain number of cases of this character gradually improve without operative treatment, it would seem probable that the perilabyrinthitis had caused a serous effusion into the labyrinth, and that later, with the subsidence of the acute symptoms, this serous effusion was absorbed. Whether operative interference in some of the more chronic cases, will enable us to deal with this class of cases, surgically, is simply a matter of conjecture. I am inclined to believe, however, that such improvement may be hoped for after a more critical study has been made of cases of this character.

The lesions due to cerebrospinal meningitis, which, as before stated, is one of the most potent causes of acquired deafmutism, consist of an inflammation of the auditory nerve trunk, with an infiltration, more or less extensive, of the end organs of the auditory nerve. This infiltration affects usually both the vestibular and cochlear apparatus, so that, in addition to the profound impairment of hearing, disturbances of equilibrium are exceedingly common. The sense of equilibrium is usually regained after a comparatively short time, but the impairment of hearing usually remains permanent, except in those few cases where it yields to internal medication.

In certain of these cases of cerebrospinal meningitis, in addition to the changes in the auditory nerve trunk and cochlea, we have changes in the aqueductus vestibuli and aqueductus cochleæ. These two channels are either partially or completely obliterated as the result of the meningeal inflammation, and it is fair to assume, in many of these cases, that the labyrinthine involvement occurs through these channels as avenues of infection.

In syphilis the lesion may lie either in the trunk of the auditory nerve or in the labyrinth itself. A differential diagnosis here is sometimes quite easy, as in a case which came under my observation a short time ago, in which, five months after the primary lesion, the patient suffered from profound deafness in one ear, and a decided disturbance of equilibrium. Both labyrinths were proven active by the rotation test. In this case there was spontaneous nystagmus to the affected side. The electric stimulation of the auditory nerve gave a paradoxic reaction. Owing to the activity of the vestibular apparatus on each side, and the fact that the cochlea was apparently intact, as evidenced by normal upper and lower tone limits, and also from the fact that there was a possible paradoxic reaction of the auditory nerve to galvanism, the lesion was located in the meninges, in the neighborhood of the auditory nerve. The patient was put on antisyphilitic treatment, consisting of large doses of iodid of potassium together with mercury internally, and later the hypodermic injection of salicylate of mercury. At the present time, all of the vestibular symptoms have disappeared, and the patient's hearing has become nearly normal on the affected side. In this case, there was undoubtedly a pachymeningitis involving the auditory nerve sheath.

In certain cases of specific disease gummatous deposits have been found in the internal auditory meatus, causing pressure on the auditory nerve trunk.

It is particularly important, in specific cases, to make a diagnosis between involvement of the labyrinth, on the one hand, and the involvement of the auditory nerve trunk, on the other. The labyrinthine lesions yield best to the administration of pilocarpin, in conjunction with iodid of potassium, while the lesions of the auditory nerve trunk yield most easily to the administration of the antisyphilides in large doses, particularly to large doses of the iodid of potassium, after mercurialization has been established.

In this connection, it might be well to mention Ehrlich's new remedy, "606." In the case referred to, advisability of administering this drug was seriously considered, but in consultation with Doctor Fordyce, it was decided that, owing to the untoward effects which Ehrlich had reported in cases of cerebral syphilis, the administration of the drug was not warranted. The improvement of the patient under the ordinary antispecific medication, seems to have borne out this view.

It would be possible to continue a citation of various lesions causing profound impairment of hearing, indefinitely, did the time warrant. I must remember, however, that I am to be followed by one who is to speak on the subject of "Educating the Eye to Substitute for Deaf Ears," and in closing my paper, I wish to make a few remarks upon this subject.

When should the eye be used as a substitute for the ear in cases of impairment of hearing? Personally, I believe that in every case where the acoustic sense for a moderate whisper is less than five feet, in either ear, the patient will derive considerable benefit from the training of the eye so as to aid the ear. I do not mean by this statement, that the eye should be used as a substitute for the ear, and herein, I think, the advocates of the socalled ocular method have made a serious mistake. As soon as a patient depends more upon his eyes than upon his ears, the auditory function will become more impaired by disuse. When, however, the patient uses his eye as an aid to his impaired hearing, but not as a substitute for his defective auditory mechanism, in those cases I believe not only do the patients receive decided benefit, but the auditory sense will be stimulated. It is only necessary for a normal individual to attend either the theatre or the opera, to recognize how much better he hears when he is seated in such a position as to see the lip motions of the performers, to understand how great an aid the ocular sense becomes to the sense of hearing. The more the hearing becomes impaired, the more must the eye be depended on. The point which I wish to make is that lip reading should never be taken as a substitute for hearing, excepting in those profoundly deaf. As an aid to hearing, thus relieving the fatigue of an overstrained auditory nerve, I believe it is of great value. If, however, a patient learns to rely more upon the sense of sight, in his intercourse with his fellow beings, than upon the sense of hearing, he not only fails to exercise what little auditory function he has, but, by failing to exercise this function, loses completely his sense of hearing for his own voice. The so-called "deaf voice," formerly so commonly observed in those with profound defect in hearing, will certainly result unless due attention is paid to the preservation of whatever auditory function the patient has. My own belief is, therefore, that a combination of the ocular method, with the conservation and education of whatever auditory function the patient possesses, will give us the best results in the treatment of cases suffering from profound auditory defects.

VII.

A NEW METHOD OF ELICITING THE FUNCTIONAL EAR TESTS. PRELIMINARY REPORT.*

By Edmund Prince Fowler, M. D.,

New York.

Information derived from the functional tests of the auditory apparatus often proves unsatisfactory because of the patient's inability to recognize degrees of intensity in musical notes, and especially slight differences in the perceptive power of one ear as compared with its fellow. Under these circumstances much time and effort is required to elicit any valuable data from the examination. Especially are we liable to meet with difficulties in little children.

The method I bring to your notice depends for its utility on the physical phenomena produced when two notes not quite in unison are heard at the same time. Under this arrangement the resulting sound will be found to alternate between a maximum and a minimum of loudness occurring periodically. These periodical fluctuations are called beats.

To better understand the subject, let us briefly recall a few important facts bearing thereon.

Musical sounds are capable of variation in pitch, loudness and quality.

Pitch depends upon and rises with the number of vibrations per second. Loudness depends upon and increases with the energy of the vibrations reaching the ear, and therefore, on the amplitude of the vibrations of the body whence the sound proceeds. Pitch also influences loudness, for of two notes of equal intensity of vibration, the higher note always exhibits to the ear the greater intensity.

Quality or timbre is a term used to express the difference between sounds emitted under different circumstances, as by different instruments, or human voices. Beats are produced by the interference of two sound waves having slightly different periods. It may be easily shown that the number of beats per second is always equal to the difference between the number of vibrations occurring in the same time, corresponding to the two interfering notes. It follows, therefore, that the more these notes are out of tune, the more rapidly will the beats follow each other.

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Beats are also produced, though less distinctly, when concords, such as thirds, fifths, etc., are not perfectly in tune.

Beats are very useful in the tuning of musical instruments, especially for the higher notes, for in these the same difference between the number of vibrations indicates greater deviation from perfect unison than it does for two notes of lower pitch. As the number of beats increases, the effect on the ear becomes more and more unpleasant, until it finally degenerates into an irritating rattle. This effect occurs with the middle notes of the musical scale when the number of beats is twenty to thirty per second. The disagreeable impression of beats on the ear is ascribed by Helmholtz to the same physiologic cause to which is due the painful effect on the eye of a faint, flickering light. As in the eye, so also in the ear the receptive mechanism is unable, under the repeated and intermittent stimulation, to lose its sensitiveness in great degree, as normally occurs when continuous vibrations are received. The irritation caused by the same number of beats is much less in the lower register and can even become a pleasing concord. I find that for my tests (using, say the C^1 forks) from two to twelve beats per second best answers the purpose.

Although the twin forks may be used to advantage in nearly all of the fork tests, and in Rinné's, Schwabach's, Gellé's and Weber's especially, I shall consider in this paper its application in but one, namely, Weber's. It is in this test that I first noticed its superiority over the single fork method.

If the pitch of one of two forks, tuned exactly in unison, be lowered by slipping over one of its prongs a small piece of rubber tubing, or moving the overtone clamps, and both forks be simultaneously sounded, bursts of sound will be heard at intervals, and these will increase in frequency as the difference in pitch between the two forks is increased. With these two forks, slightly differing in pitch, one in each hand, we are ready to apply the tests. Strike one prong of the fork held in the right hand against one prong of the fork in the left hand. (This insures equal intensity to the vibration of both forks.) First place one fork on the vertex and after the patient has fixed his attention and is endeavoring to determine which ear better perceives the sound, place the second fork on the vertex over the lambda. If there is any difference in the perceptive abilities of the two ears, it is surprising how quickly the patient will note it, and inform the examiner.

I have used this test for a long time, and in scores of cases it was impossible to determine on which side Weber was better heard until the twin forks were both vibrating on the skull. In many cases patients can better appreciate the difference between the perceptive ability of the two ears if before the forks are placed on the vertex the ears are closed by a moistened finger and then alternately opened while the forks are vibrating.

The explanation usually accepted as accounting for the increased perception of sound by bone conduction, as in middle ear obstructions and in Weber's experiment, is that any obstruction in the conducting apparatus causes the sound waves to be reflected back into the internal ear, and thus reinforce the vibrations on this side, making them better heard in the more affected ear.

This is very well so far as it goes, but may we not add that one of the reasons for the increased perception in the diseased ear is that the reflected vibrations cause increased perception, not only because they are added as such, but because both the direct and reflected vibrations are more irritating to an ear whose perceptive mechanism is in a state of comparative rest as compared with its more active fellow, and is therefore more sensitive to sound waves, which are conducted to it through the skull with equal or greater facility than to the better ear? This may account in part also for the greater irritation conveyed to the diseased ear by the twin forks on the vertex, for musical beats must be especially irritating to an organ unaccustomed to their influence.

It is also conceivable that thickened folds of mucous membrane and cicatricial or fibrous tissue, etc., may serve as a better conductor of sound from the vertex to the diseased ear than would more normal tissues.

By using the twin forks, not only does the blocked ear receive the increased vibrations from the reflected sound waves, but it receives all vibrations in greater intensity and in periodic fluctuations, which latter, as we have shown, are especially irritating to the auditory nerve, and besides enable slight differences in intensity to be more easily noticed than is the case with even tones. If the vibrating twin forks are held one before each ear of the patient, he can determine more easily which ear hears the better by air conduction, for the presence of the beats is of great assistance.

By using the method described one can ascertain within a few seconds, first, which ear hears the better by air conduction, and, second, in which ear craniotympanic conduction is accentuated. Applying the forks to one's own vertex, and stopping up one ear will give at once a practical demonstration of the experiment.

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VIII.

SARCOMA OF THE NOSE AND NASOPHARYNX.*

By T. H. Farrell, M. D.,

Utica, N. Y.

A. H., aged 46. This man consulted me first August 6, 1906, complaining that "three weeks ago he began to have like a cold in the head"—obstruction to breathing, followed in one week by a four-smelling and foul-tasting discharge.

The right side of the nose was free; the left anterior naris was greatly narrowed by a spur, and was occluded by a mass looking like wet cotton. On manipulation there was persistent bleeding and the probe easily penetrated a movable mass until it felt rough bone on the outer nasal wall. No pedicle could be made out. There was a foul mucopurulent discharge. Several pieces were removed and submitted to a pathologist, who reported sarcoma. The patient declined further treatment, as his breathing was relieved and he did not like the diagnosis.

However, he consulted a cancer specialist, who told him he had a simple catarrh and gave him a solution to be used in a syringe. The third time it was used it brought on a severe epistaxis, which lasted for twenty-four hours and made him willing to submit to operation. On consultation with a general surgeon it was decided to remove the left superior maxilla as the growth did not appear to be pedunculated and the authorities I had at hand stated that sarcoma of the nose usually spread from adjacent structures.

September 10th (five weeks after first visit) Dr. J. H. Glass excised the left superior maxilla with the growth attached. It was a large friable bluish-red mass with a comparatively small attachment in the region of the ethmoid. The antrum was free from disease. The pathologist reported the neoplasm to be a glandular sarcoma.

Healing took place with a fenestrum in the hard palate. This made a convenient window for examination of the left side of the nose, the anterior naris being exceedingly narrow.

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Nine months later he began to have recurrences which manifested themselves by epistaxis. These growths were usually pedunculated and the hemorrhage was immediately controlled by severing the attachment.

The recurrences took place from the surface of the posterior ethmoid cells and anterior wall of the sphenoid on left side, then appeared in the same localities on the right side and in Rosenmueller's fossa.

On October 29, 1907 (fifteen months after first appearance), the nasal membranes appeared normal. Five weeks after this a polypoid mass was removed from the left side, the attachment being on the outer wall near the floor. A month later, January 8, 1908, the neoplasm reappeared in Rosenmueller's fossa, with a dark red appearance of the left half of the palate and ethmoid region. All tumefactions were thoroughly curetted.

In six months the curetting had to be repeated, and in August of this year (1908) the left external carotid artery was tied off, but without effect, as another curetting had to be done in September, following which the nasopharynx took on a healthy appearance. The patient was now put on Fowler's solution, but two months later a pink nut-like movable tumor appeared in the right side of the nasopharynx, attached posterosuperiorly to the eustachian tube, while a dark red mass was seen back of left eustachian eminence covered with a foul-smelling grayish discharge requiring the use of creolin in a douche. The pink nut-like mass was snared and sent to Dr. Jonathan Wright, January 22, 1909. He reported as follows: "This specimen is undoubtedly a sarcoma. I should classify it as an alveolar sarcoma. I believe that this class of malignant connective tissues springs from the endothelium, so that perhaps a more appropriate name would be alveolar endothelial sarcoma."

About this time an enlarged gland was noticed in the right side of the neck.

In February, 1909, the soft palate was divided in the median line and the nasopharynx thoroughly evacuated of a large mass og new growth, mostly from left side. Healing took place speedily, with an improvement in the appearance of the membrane covering the sphenoid, but this was only of a short duration.

He now complained of his stomach and began to look cachectic. His general health up to this time had been good, but he now rapidly failed and died about two and a half years after first appearance of growth. It is worthy of remark that the nasal growths were superficial, while those in the nasopharynx penetrated deeply.

J. A. Watson had a most interesting article in *American Medicine* for April 2, 1904, based on a study of 150 cases, including the reports of 49 cases collected by Bosworth and 62 by Gibbs. I have been able to collect 18 cases not contained in the above, besides the one just reported. It would therefore appear that the disease is not so rare as the textbooks suggest.

These nineteen cases comprise nearly all varieties: Unspecified, 4; round cell, 4; spindle cell, 2 and round and spindle cell, 1; lymphosarcoma, 2; chondrosarcoma, 1; angiosarcoma, 1; melanosarcoma, 1; endothelial, 1; fibrosarcoma, 1; alveolar, 1.

As regards the point of origin the middle turbinate and ethmoid is mentioned five times, the base of the cranium once, the septum and floor three times, the inferior turbinate once.

In three cases the maxillary sinuses were involved by extension, and in one the frontal sinus. In contrast to this I have seen sarcoma of the maxillary sinus three times without any involvement of the nasal mucous membranes in any one of them, though the nasal passages were narrowed by pressure.

In respect to sex this series differs from Watson's, in that the more numerous are females, there having been eleven females and ten males.

The general view that sarcoma is a disease of youth is confirmed by this series. There were five cases in the second decade, four in the third, two in the fourth, one in the fifth, two in the sixth and four in the seventh. Thus it appears there were eleven occurring before forty and seven after.

The question of diagnosis is generally an easy one. The neoplasm is as a rule yielding, friable and vascular, though the fibrosarcomas may be dense and hard. The color varies considerably. In this series nasal stenosis occurred in practically every case and usually early; pain is mentioned in seven cases and epistaxis in six cases, though it is probable that hemorrhage occurred more frequently, and is the second most common symptom. Exophthalmos occurred in four of these nineteen cases and swelling of the cheek and nasal bones in five cases, though these are late manifestations. Offensive purulent discharge is a distressing concomitant.

The microscope is a valuable aid in confirming the diagnosis, and when positive should make us doubt clinical evidence of benignancy. On the other hand, Raoult's case illustrates how the histologic examination may declare for nonmalignancy and yet the disease run a characteristically fatal course.

The occurrence of metastasis is rare. In my own case there was one small cervical gland enlarged, which may not have been sarcomatous. In Braislin's case there was a general infection of the subcutaneous lymphatics. In no other case was it mentioned.

In the large majority of these cases surgical treatment was the only one relied upon, though benefit is claimed from X-rays in one, injections of adrenalin solutions in another and yellow oxide of mercury ointment with an alkaline spray in still another. In none of them does the treatment by toxins seem to have been instituted.

The percentage of cures by external operation have been unusually large, viz., three out of five. In nine cases submitted to internal operations recovery occurred four times, recurrence or death four times, and the result was unknown in one.

The extended experience I had with the one case would prejudice me in favor of intranasal operation. A radical antrum operation would have accomplished quite as much as the excision of the maxilla. It was remarkable how often the nasal growths had a small pedicle and how infrequent recurrences were at these points.

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IX.

A CASE OF CARCINOMA OF THE PINNA AND EXTERNAL AUDITORY CANAL.

By Hugo A. Kiefer, M. D.,

Los Angeles.

The patient, J. N., male, age 48 years, miner by occupation, presented himself to me July 13, 1910. For two years past the left ear had been discharging pus and blood for variable periods, with intermissions, when there would be no discharge whatsoever. The last attack of the running of the ear lasted for two weeks, and had not yet ceased when he presented himself to me. He said that he had likewise had periods of bleeding from the left nostril, and that this condition had started even before the ear became sore. Both conditions, according to his idea, started with a cold. During this period of two years he had treated with a number of physicians, using a variety of washes and salves. But in spite of all these treatments the condition continued to grow worse.

When he presented himself to me, practically the whole area of the inner surface of the tragus, antetragus, concha, and the external auditory canal to within ¼ cm. of the tympanic membrane, were almost entirely denuded of epithelium, and the swollen, roughened cartilage was exposed to view. Granulations were scattered thickly over this area, and bled very freely to the touch. A small amount of thin pus was also present, mixed with the blood. The margins of the affected area were red and somewhat elevated, irregular in outline, but not undermined. An area of infiltration extended a mm. or two beyond the line of demarcation. Pain was only occasional, and when present it was in the nature of a sharp, pricking pain.

On the whole the condition resembled very much some cases of eczema, except for the free bleeding, and this, associated with the fact that the patient was not overanxious to be put under an anesthetic, led us to try the effect of palliative treatments, though the tentative diagnosis of carcinoma had already been made. Accordingly the entire affected area, which was practically insensitive, was lightly curetted, and the application of a 2% silver nitrate followed. Daily thereafter there was made one application of a similar strength of silver nitrate, and several douches of boric acid, and corrosive sublimate one to ten thousand. In the course of several days' treatment, however, there was no sign of any improvement, and it was therefore determined to anesthetize the patient for the purpose of obtaining a specimen of the tissue for microscopic examination.

Accordingly on July 19, 1910, under a general anesthetic, two pieces of tissue were removed, one from the concha, the other from the auditory canal, each bearing a portion of the healthy skin outside the line of demarcation, as well as a portion of the diseased cartilage. These specimens were submitted to Dr. E. L. Leonard, who returned a report of "malignant sarcoma, probably originating in the ceruminous glands."

The patient submitted himself to operation July 25th. An incision was made through the entire circumference of the soft tissues of the canal ¼ cm. from the tympanic membrane, by means of a small knife, with the blade bent at right angles on the flat. The skin of the back of the ear was incised throughout the entire length of the fold formed by the helix and concha, and dissected free from the underlying cartilage as far as the temporal bone. An incision was then made through the healthy skin on the anterior surface, following the ridge formed by the concha with the helix, tragus and antetragus, and this incision was deepened so as to pass through the entire thickness of all the cartilage encountered until the blade met the temporal bone all around. Bleeding, which was quite difficult to control, was stopped by passing catgut sutures through the soft tissues and underneath the proximal ends of the bleeding vessels. The bell-shaped piece of soft tissue forming the concha was then raised, and the soft tissues of the canal were separated from the bony wall by means of dull elevators, so that the entire mass was lifted out of the canal, leaving the bare bone exposed to within ¼ cm. of the tympanic membrane, which was uninjured. The parts were then flushed with saline solution, antiseptics not being used in order to avoid any interference with the growth of the skin grafts. Four strips of skin, each measuring 1¾ inches in length by ⅛ inch in width, were now taken from the thigh and laid longitudinally along the external auditory canal and the other denuded portions, and were held in position by means of a light packing of gauze soaked in sterile saline solution. This dressing was left undisturbed for five days. Inspection now showed the grafts in place, but they had the appearance of possibly being dead. However, they were left in place two days more, making seven days in all, and were then removed, being dead. But by this time nice granulations were springing up all over the denuded area of bone.

On August 9th the patient was again anesthetized, and four more strips of skin, the same size as the former, were taken from the thigh and laid the same way in the canal, and held in place by a gauze trailer soaked in boric acid solution. This was left undisturbed for two days, and then was cleansed daily with 25% peroxide of hydrogen solution, followed by normal saline solution, and packed lightly with the boric acid trailer. Bichloride moist dressings were not used till August 16th, for fear of injuring the grafts, which had a splendid, healthy appearance. A few days after this date, on account of a little exuberance of granulations, occasional applications of tincture of iodine were made, which reduced them nicely. On August 19th a small bleeding area was noticed on the helix, about ½ cm. beyond the operated region. This was curetted and cauterized with 10% silver nitrate, and the same procedure was followed on the next day.

On August 29th the patient was discharged, the entire operated area being healed and beautifully epithelialized, with no deformity resulting, nor even any scarring except such as would be revealed by close inspection. Hearing had been undisturbed by the operation, and apparently also not disturbed by the growth.

Though strict injunction had been laid on the patient to report at once any sign of soreness returning in the ear, a letter received from him recently made no mention of any such thing occurring.

213 Fay Building.

X.

EDUCATING THE EYE TO SUBSTITUTE FOR DEAF EARS.*

By Edward B. Nitchie,

New York.

It is well known that the blind in a measure substitute hearing for sight; sounds of traffic in a busy street are a confused roar to the untrained ear, but to the experienced blind man they are a fairly reliable guide on his way. Even to a greater degree can the deaf man train his eye to substitute for his deaf ears. If you will watch my mouth as I am speaking now, you will see many clearly defined movements of the lips, perhaps even of the tongue. The eye trained to associate certain movements with certain sounds has the power of interpreting these movements into words and sentences.

A very large percentage of the deaf are, I believe, incurable, at least at the present state of medical and surgical knowledge. The greatest loss to anyone who is deaf is the loss of understanding speech. Inability to hear music or the voices of nature is a deprivation; but inability to hear spoken language is a calamity, unless other means than the ear can be found to convey the message to the brain. For in the ability to understand spoken language lies the way not only to the pleasures of life, but to the truest necessities of soul and body. Deafness is a physical bar to employment second only to blindness, and bears especially heavily on the man who, dependent on others for his salary, becomes deaf in adult life. Lip reading, or speech reading, "that subtile art," as Dr. John Bulwer said in 1648, "which may inable one with an Observant Eie to see what any man Speaks by the moving of his Lips," is a valuable substitute for hearing, as far as spoken language is concerned, though like any other substitute it has its limitations.

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*Read before the Section on Otology of the New York Academy of Medicine, December 9th, 1910.

By it the sense of sight is forced to interpret a medium for expressing thought which, throughout the history of the race, has been developed for the needs of the sense of hearing. I shall show later how imperfectly spoken language is fitted to the requirements of successful lip reading.

The problem of the teacher varies according to the class of the deaf to which his pupil belongs, for the deafmute's needs are only in part the needs of the hard-of-hearing. My work lies with the hard-of-hearing—and by that term I mean those who, either partly or totally deaf, become so after having acquired speech and language—and it is of their problem of which I shall speak particularly. It is not only their problem; its solution becomes also the solution of the problem of the deafmute after he acquires speech and language.

With the deafmute, speech, language, and lip reading go hand in hand; ability in one grows as it grows in the others. The language and speech which a deafmute child must be taught through the senses of sight and touch, the hearing child absorbs naturally, without conscious effort, through the ear; and in addition, the deaf child must be taught to "hear with the eyes," a task never set for the normal child.

The language problem is not only a question of vocabulary; it is also the problem of grammatical forms and construction and of idiom. The speech problem involves a knowledge of the formation of the different sounds, constant practice in the use of them, and accent, tone, and rhythm. We who gain our speech through the ear do not have to be taught these things; probably nine out of ten of us have no more idea of how we use or move the organs when we speak than we have of how we digest our food.

Some deafmutes have a more or less rudimentary sense of hearing, which can be developed by aural or auricular training. How much the hearing can actually be increased is a question, but at least a more accurate conception of the sounds, of accent, tone and rhythm can be inculcated than through oral training alone.

The problem of lip reading for the deafmute is in many respects that of the hard-of-hearing, but is made much more difficult for him by reason of his limited vocabulary. As soon, however, as a good vocabulary is acquired and as soon as he is no longer "mute," then his problems in reading the lips and those of the hard-of-hearing are much the same. The hard-of-hearing of course do not have the problem of speech and language.

I have entitled my paper "Educating the Eye to Substitute for Deaf Ears"; more correctly it might be "Eucating the Mind, with the Help of the Eyes, to Substitute for Deaf Ears." For the problem of teaching lip reading is truly a psychologic problem. Both the eyes and the mind must be trained, but mind training is the more important factor.

The difficulties for the eyes to overcome are two: First, the obscurity of many of the movements, and second, the rapidity of their formation. That spoken language is not well adapted to the purpose of lip reading is evident from the many sounds that are formed within the mouth or even in the throat. The difference between vocal and nonvocal consonants is absolutely invisible to the eye. The aspirate *h*, as in "hat," cannot be seen; there is no visible difference between "hat" and "at." The consonants formed by the back of the tongue and the soft palate, *k*, hard *g*, *ng*, are seldom revealed to the eye of the lip reader; likewise, certain tongue consonants, as *t*, *d*, and *n*, and *y*, present almost insuperable difficulties. Double tongue consonants, as *nt*, *nd*, *lt*, *ld*, are also just as indefinite and obscure in their visible formation. See the result: The following words —watch my mouth as I say them—are not only difficult, but also, because their consonants are practically invisible, and because the vowel is the same in each, are in facial appearance almost as alike as two peas: End, egg, Ed, hen, head, held, yet, yen, ten, tent, tend, Ted, debt, den, dead, dent, dealt, net, Ned, knelt, deck, neck, get, ken, Kent, keg. Twenty-six of them! And this is not all, for long *a* is hardly distinguishable from short *e*, so that to the twenty-six we will add: Ate, eight, aid, ache, hate, hailed, taint, Dane, date, nailed, take, gate, gait, gain, gained, Kate, cake—seventeen more, making forty-three words which the eye unaided has the greatest difficulty to tell apart. If the lip reader were making over the language he would cast all these difficult consonants into limbo, and along with them some of the more difficult vowels, as short *i*, long *e*, short *e*, long *a*, and short *u*.

Rapidity of the movements is another serious difficulty in the way of successful lip reading. From 1/12 to 1/13 of a second is the average time per movement in ordinary speech. This is the average, but some movements are of course slower, while others, particularly those for unaccented syllables, are much quicker.

With such difficulties as these, the wonder is that anyone can read the lips at all. Eye training can never eliminate them, though it can lessen them in a measure. The method should aim first always to study or see the movements in words or sentences, not formed singly by themselves. Sounds pronounced singly always tend to be exaggerated, and many of them even to be grossly mispronounced. Moreover, one movement often modifies decidedly the appearance of another connected with it in a word. For example, long *e* usually tends to show a slight drawing back of the corners of the mouth, as in "thief," but after *sh,* as in "sheep," this is rarely visible.

In the second place, the method should aim always to study or see the movements as the words are pronounced quickly. It is true that it would be easier to see them when spoken slowly, but it is also true that to produce the best results the eye should be trained from the first to see things as they must always be seen in ordinary speech, and that is rapidly.

And in the third place, the method should aim to inculcate a nearly infallible accuracy and quickness of perception of the easier movements, leaving to the mind in large measure the task of supplying the harder movements.

With the eye thus trained it often happens that the lip reader's impression is that of actually hearing what is said. If I put the tubes of a phonograph into my ears, so that I can hear every word, and close my eyes—unbidden and without conscious effort—the vision of the moving lips of the speaker forming the flow of the words passes before my mind.

Although it is not possible for the eye to see each and every movement, it is possible for the mind to grasp a complete impression without even the consciousness that it has "supplied" so many of the movements and sounds. The chief difficulties in the way of the mind in lip reading may be indicated by describing that type of mind which is uniformly most successful, and that is a mind which is quick to respond to impressions, or quick in its reaction time, and a mind in which the synthetic qualities are dominant. The difficulties then are to overcome the opposite conditions or tendencies, and the aim is to develop the mind to the utmost along the line of these favoring conditions.

Fortunately thought is quicker than speech. Testing myself with a selected passage which I know by heart, it takes me fifteen seconds to think of it word by word, and thirty-five seconds to read it aloud. To develop quick perception, practice is the essential; that is, slow speech, word by word utterance, must be avoided, and all forms of exercise must be given to the pupil to the limit of speed which his ability to understand will allow. This undoubtedly makes the work harder for the time being, but it results in more rapid progress.

Not only is thought quicker than speech; thought need not formulate every word to have clear conceptions. Thought skips; thought looks ahead and anticipates. So that a correct understanding of an idea is possible without a word for word accuracy. That is the way the baby understands what is said to him. I will say to my little boy, a year and half old, "How does daddy shave himself in the morning?" That he understands every word is not possible; probably "daddy" and "shave" are the only ones he really knows. But that he understands what I say he makes evident when he goes through the motion of shaving his own face with his finger.

The method of mind training should aim to develop this power of grasping thoughts as wholes, and to avoid strictly anything that will enhance the opposite tendency of demanding verbal accuracy before anything is understood at all. There are many minds of the latter type; they are literal, analytical, unimaginative. Yet there are very few who are altogether of this kind; most of us, however analytical, have some synthetic powers, some ability of putting things together, of constructing the whole from the parts, of quick intuitions. It is by developing these powers that real success in lip reading can be attained. And it is by working along these lines that the surest way is found in the end to the understanding of every word. Even you who hear, often have an experience like this: Someone will make a remark which you fail to understand; the word "What?" is on your lips, but before it is fairly uttered the whole sentence will come to you like a flash. When this intuitive, synthetic power is already highly developed, the "natural born" lip reader is the result. I feel sure, from what is known of the men, that Prescott, the historian, would have easily learned lip reading, while the analytical Bancroft would have found it much more difficult; that Seton Thompson would be quick to master it, and that John Burroughs would be slower; that Roosevelt would be an expert, and that Hughes would be a novice. I have repeatedly found among my pupils that those who can play music readily at sight are apt in reading the lips, for such ability implies both quick reaction time and the intuitive mind.

I develop the synthetic qualities in my pupils by various kinds of exercises. For the homophonous words, such as the list of forty-three which I have mentioned, I give sentences containing the different words, compelling the mind to insert the right word according to the thought of the sentence. For example, in the sentence, "Did you have a soft-boiled egg for breakfast?" egg is the only possible word from the entire list that fits the rest of the thought. Or take the sentence, "Will you — me a drink of water?" If I say that inaudibly, supplying the missing word, "Will you get me a drink of water?" who would not know the right word to select from the forty-three?

Other means of developing the synthetic qualities are by the use of conversation, stories and lectures, coaching the mind to grasp the idea even if words are lost; by telling stories in one form and then repeating the same thought with entirely different wording; by asking questions to which the pupil replies if the thought is understood even if many of the words are lost.

Does not this mean guesswork? Yes, but a trained and intelligent guesswork that knows how to act along the line of the natural associations suggested by the word or words that have been understood. Guesswork cannot be entirely eliminated, but it can be guided; and it is by such guidance that lip reading becomes feasible for ordinary colloquial utterance. If dependence is had only upon eye training it tends to compel a necessity for slow, word by word speech, and exaggeration or "mouthing."

What degree of skill can a lip reader expect to attain? And how long does it take? These are natural questions, but cannot be answered categorically. What some can attain in three months others cannot acquire short of a year; and the highest degree of skill, as in any art, is open only to the few. But three lessons a week for three months will with most pupils give a very satisfactory and practical skill. I may be pardoned if I speak of myself. I can sometimes understand a lecture or sermon, depending upon conditions of light, of the subject, of the speaker's mouth and manner, etc.; less often can I understand a play. I am called a good lip reader, but I know better ones.

With very few exceptions, such a degree of skill is possible to everyone as to make home life and social friendships a joy once more, and though it may not be an infallible resource in business, it may for all be an invaluable aid. Lip reading can never do all that good ears ought to do, but what it can do is almost a miracle.

Two objections to lip reading I occasionally hear from physicians: (1) That it is too great a strain on the eyes; and (2) that by relieving the ears from hearing, there is a tendency to deterioration from lack of exercise.

The strain upon the eyes at first is truly no small one. But I have repeatedly found that those who complain of eye strain during their first lessons, later never think any more about it. I have not very strong eyes, and now, though I use them in reading the lips every day and all day long, they seldom are overtired. If the lip reader is careful from the first to cease using the eyes at the first symptom of tire, I believe that no harm can result, and gradually the eyes will be able to do more and more.

The objection in regard to the deterioration of hearing I believe to be the reverse of true. Dr. Albert Barnes, in *The Dietetic and Hygienic Gazette* of a year ago last October, said: "People with ear strain should spare the hearing as much as possible, and instead of straining the ear to catch what is said they should watch the lips more. In other words, the eyes should be called upon to help the ears." Moreover, with pupils who have enough hearing to hear the sound of the voice I advise and encourage them to use ears and eyes in fullest cooperation, one helping the other. Under such circumstances, and also in view of the fact that the ear involuntarily gets exercise with every sound that comes to it, whether the strain to hear is made or not, I do not—speaking as a layman—see how any harm can be done to the ears by lip reading, and in all my experience I have never found any evidence of such harm. On the contrary, several times pupils have reported to me an actual betterment of the hearing, though how much lip reading had to do with it and how much other conditions, I do not pretend to say.

Lip reading then is not a cure for deafness; nor is it even a cure for all the ills of deafness. But from some of the worst ills it is a true alleviation. It takes first place on the majority of occasions over all mechanical devices. For those completely deaf, or so deaf as to make mechanical devices out of the question, lip reading is the only resource. For those whose deafness still allows them to hear the sound of the voice, it obviates the necessity of using these more or less cumbersome and inconvenient contrivances. Even at such times when these devices can be used to advantage, watching the lips helps to make them more useful and reliable. Under any circumstances, lip reading has in it the power to make deafness of whatever degree much easier to bear.

XI.

THE IDEAL CLINIC IN LARYNGOLOGY.

By Arthur J. Huey, M. D.,

New York.

The treatment of diseases of the nose and throat is carried on to a greater extent in an out-door clinic, without the aid of hospital facilities, than any other clinical division of our profession, with the single exception of dermatology. At the same time the clinic in laryngology, without exception, requires more elaborate equipment and more careful organization for its successful and satisfactory operation than that of any other specialty. A short study of the difficulties met in the running of such a clinic may therefore be of interest to those who are trying to overcome them.

Equipment.—The proper "housing" of the clinic with regard to economy of space and ease of operation first demands our attention. While this will of course depend largely upon the routine to be followed and the space at our command, the most practicable division is to provide three rooms, if possible, with an additional small dark room for transillumination.

The first room is used for taking the history and making the primary examination of new cases. In order that the examination may be thorough, it is essential that it should be conducted systematically and amid as little confusion as possible. This is best accomplished by this part of the work being done by one physician and a nurse. The room may be comparatively small, containing sink, sterilizer, table and light for physician, and desk for nurse, at a convenient distance for her to take down dictation of conditions found. With a little care the position of the desk can be so arranged as to allow the nurse to take the personal history of the patient previous to the examination without changing her position.

The second room should be entirely for the treatment of old cases. Each member of the staff should have his own table or booth, the sink, sterilizer, instrument cabinet and writing desk may be conveniently used in common.

The third room should be an operating room, where a general anesthetic may be given when desired. The nearer this room approaches the ideal hospital operating room in equipment the better. In addition it should be provided with an operating chair, properly screened from the rest of the room, where the longer operations under local anesthesia may be performed. Whenever the operative cases are numerous, adjoining narcosis and recovery rooms are of great convenience in handling the cases.

The dark room contains a transillumination apparatus. It may be of small size, and should open off of the room for the examination of new cases (if impossible to have it connect with both rooms).

The selection of instruments and furniture for the clinic is too large a subject to enter into in a paper of this length. Let me suggest, however, that the instruments should be supplied by the clinic. The practice of requiring each member of the staff to bring and use his own instruments, as followed in some institutions, never works well. It often happens that an assistant does not own the best instrument for the purpose, or if he does it is not on hand when wanted. It is much better to have at the clinic a complete outfit of useful instruments, carefully selected by the physician in charge. This adds materially to the expense, of course, especially to the running expenses, when the cost of repairs and new instruments is counted in, but the results are well worth the outlay. The advantages of a card system of records are so well recognized that they need but to be mentioned.

Staff.—The staff should consist of an attending physician with as many assistants as necessary, a clinic nurse, and if the operating room is to be used during clinic hours, a second nurse to assist at operations is necessary.

Routine.—A carefully arranged routine should be established and strictly followed. This not only increases the interest of the staff, but also adds greatly to the efficiency of the clinic, doing away with confusion and neglect. The routine must be arranged to suit individual clinics, but that of which the following is an outline has proved in the main satisfactory.

The nurse having previously taken the personal history of the new cases (before the clinic hours, if possible), calls a new case into the first room for the primary examination. It is best that this examination be made by the physician in charge. This may seem to impose an irksome routine on the attending physician, but in skilled hands the examination of the majority of cases is quickly made, and in no other way can he keep in touch with all the cases, and regulate the treatment. The result of the examination is dictated to the nurse who records it on the patient's record card, together with suggestions for operation or treatment. The case is then assigned by the attending physician to one of his assistants, the name of the assistant being stamped on the record card and also on the patient's identification card. On returning to the clinic the patient is called into the second room by the assistant to whom he was assigned, and the recommendations for treatment previously noted on his card by the attending physician are carried out. If for any reason the attending physician wishes to see the patient a second time, he need not assign him to an assistant at his first visit, in which case the patient returns to the attending physician at each subsequent visit, together with the new cases, until assigned. If an assistant wishes further advice about a patient he may at any time bring him in to the attending physician for consultation, and should always return the case for re-examination before final discharge. To regulate the use of the operating room, operations done under a general anesthetic should be done by appointment, and cards given to the patient showing the time, etc.

The above outline may at first sight seem to indicate a rather cumbersome and inflexible system. A little study, however, will show the opposite to be true. In the absence of the attending physician the first assistant assumes his duties, examining and assigning the new cases. A case of uncertain diagnosis he may leave unassigned, and it is seen by the attending physician at his next visit. Or the physician in charge may at any time turn over his work to an assistant, and be free to operate or otherwise employ his time, knowing that the routine will go on uninterruptedly, and that interesting or difficult cases will return to him at a subsequent visit. This system also allows one assistant to follow a case through its whole course of treatment, as is necessary both for the interest and instruction of the physician and the benefit of the patient.

With the facilities and system described all the operations and treatment necessary in laryngology, with the exception of radical operations on the sinuses, may be carried out. There will be a "hundred and one" details and problems which must be worked out by the individual clinic. Some must provide for students, undergraduate or postgraduate. There are record cards, appointment cards, blanks, etc., the printing of which should be carefully considered. And practically all institutions are hampered in doing all that they wish to do, as well as they would like, by lack of funds. None of us will attain perfection, but this paper is a plea that more thought and care should be given to the management of the clinical work of our specialty—at least the thought and care which the general surgeon gives to his hospital wards and operating room.

15 Central Park West.

XII.

THE YANKAUER OPERATION IN THE TREATMENT OF CHRONIC MIDDLE EAR SUPPURATIONS.*

By Harold Hays, A. M., M. D.,

New York City.

At the May, 1910, meeting of the otological section, Dr. Sidney Yankauer presented a series of cases illustrating the effect of the closure of the Eustachian tube at the isthmus, where suppuration had existed for a considerable length of time. In presenting the histories of these cases, Dr. Yankauer informed us that these suppurations had been due to a variety of causes, such as granulations, polypi, bone necrosis and cholesteatomatous degeneration. In other words, these patients belonged to that class where treatment had been of no avail over a period of months or years and where, as a last resort, the radical mastoid operation is proposed. In those cases shown, I am sure we all are agreed, the results were remarkable. The ears showed little of the drum membrane, the cavities were dry, the mucosa presenting a glazed appearance. There was absolutely no sign of suppuration.

At the time of the demonstration and subsequently in a most masterly paper appearing in the July *Laryngoscope,* Dr. Yankauer described the original instruments used for closing the tube. The paper described twenty-one cases in detail, of which thirteen were absolutely cured and eight partially cured; in other words, these eight cases were considerably improved and possibly in time would be cured absolutely. Parenthetically, I might mention that Dr. Yankauer's paper opens up an entirely new field in otologic work and is a masterpiece of logical thought.

I immediately became interested in Dr. Yankauer's work and learned from him personally how to do the operation, and during the past few months I have operated upon five cases in whom an ear discharge had lasted over a considerable number of years. All available dispensary treatment had been given these patients, with no improvement. Although the discharge has not ceased entirely in any of these cases, yet the improvement is so remarkable that there is little room for doubt that the closure of the Eustachian tube at the isthmus was largely responsible for any change to the better.

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*Read before the Section on Otology, New York Academy of Medicine, January 13, 1911.

I shall take a moment of your time to describe Dr. Yankauer's instruments and procedure.

The instruments which are used for the closure of the Eustachian tube at the isthmus are the salpingeal curettes. The curettes have a hemispherical head with the flat side toward the shank. The cutting edge is circular, having a sixty-degree cutting angle (Fig. 1). The projection of the cutting edge has been adjusted to correspond to the thickness of the mucous membrane. There are three different sizes—the smallest, with a projection of a quarter of a millimeter; the largest, a half millimeter. Each cutting edge has been mounted on a shank which is shaped to correspond to a curve made by the external and middle ear and Eustachian tube. A probe (Fig. 2) accompanies the curettes for purposes of exploration before cutting.

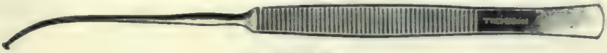

FIGURE 1.

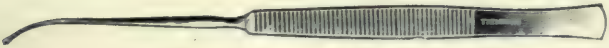

FIGURE 2.

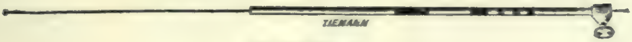

FIGURE 3.

The technic of the operation is as follows: The Eustachian tube is first anesthetized from its pharyngeal end by means of applications saturated with strong cocain and adrenalin. Dr. Yankauer's applicators (Fig. 3) are ideal for this purpose. They fit into a metal tube on which are markings to indicate how far one is in the tube. Other applications of cocain are made to the tube via the middle ear and then the tube and ear are thoroughly cleansed by irrigating with boric acid. This is best done by syringing through the Eustachian catheter. The parts having become insensitive, the tube is explored down to the isthmus with the salpingeal probe and, the caliber of the tube having been approximately ascertained, the proper sized curette is selected. The cutting of the mucosa must be done entirely by the sense of touch. The cutting edge is rotated to and fro until one feels that he is down to bone. The mucosa on the superior wall is the most difficult to cut. At the same time the cutting edge is scraped backward and forward until one has denuded a sufficiently wide area. Dr. Yankauer personally suggested to me that more extensive curetting should be done at the anteroinferior angle than anywhere else, in fact almost as far as the middle ear. As the curette is withdrawn, some strands of mucosa may be seen extending into the middle ear; after the operation is completed, the ear is dusted with iodoform powder. An inflammatory reaction takes place in the tube and middle ear, which subsides in the course of a few days. As a rule the patients are told to take the same care of their ears after as before the operation. No untoward results have yet been observed. The objection that one might readily curette into the internal carotid artery through a dehiscence in the bone is easily overruled; for if one has the least sense of touch and does this operation delicately (as it should be done), he always knows by the feel of the curette whether he is down on bone or not.

I shall summarize four of these cases:

Case I.—A young woman of 25 years had had a profuse discharge from the left ear since childhood, which had resisted all treatment. Examination of the ear revealed the presence of foul-smelling pus, a small amount of granulation tissue over the short process of the malleus, and necrosis of this bone. The granulations and malleus were removed and a week later the Eustachian tube was closed. For a few days there was a discharge of a thin mucoid material which ceased at the end of two weeks, the ear subsequently remaining dry for two months.

Case II.—A young woman of 22 years had had a profuse foul-smelling discharge since childhood. Treatment of no avail. The tube was very large. After curetting the isthmus, a pinkish swelling of the internal wall of the middle ear took place, with a discharge of a thin watery secretion, which cleared up—the ear remaining dry for about six months.

CASE III.—A young boy, 14 years of age, came to the New York Eye and Ear Infirmary complaining of continuous suppuration from the ear since childhood. Examination showed numerous aural polypi, with a profuse discharge of foul-smelling pus. The polypi were first removed with the aural snare and Hartman forceps and the bases cauterized with the silver stick. Suppuration still continuing, the Eustachian tube was curetted. For a few weeks the discharge was still profuse, but of a more mucoid appearance, and since that time it has become less and less until it has almost entirely ceased.

I was so much pleased with the results in the first three cases that I intended to present them to you at the December meeting. Much to my dismay, with the onset of the cold weather, all four cases began to suppurate again, the discharge not being so great as before the operation, but still bad enough to preclude any conclusion from being reached.

In justice to Dr. Yankauer, and in order to have us all form an unbiased opinion, I determined that it was best to let him see the cases personally and suggest some fault in my technic. So the first Sunday in December I sent the cases to his office, where we went over them thoroughly. Much to my surprise, the Eustachian tubes were closed absolutely in three of the cases (1, 3 and 4), and in the fourth bubbles of air could be forced through water in the canal, but no probe or applicator could be forced through the tube. In case I. an adhesion was found near the oval window which, on being cut through, improved the patient's hearing immediately, and the discharge is much less since that time. In case II. a number of fistulous tracts were found, behind which pockets of pus had formed, keeping up the discharge. These were opened and the tubes again curetted, since which time the discharge is very slight. In this case Dr. Yankauer found a dry hard drum membrane flat up against the inner tympanic wall, which he partially incised. Case III., the boy with the polypi, was doing so well that we decided to let him alone and watch him carefully. Although the tube seemed to be closed in case IV., it was decided to curette it again, as nothing could be found in the middle ear to account for the discharge. Since that time the ear condition is considerably better.

After this seance, I came to the conclusion that closure of the Eustachian tube at the isthmus, in itself, was not sufficient to cause a cessation of a chronic discharge in many cases; moreover, that it is absolutely necessary in a great many cases to perform some intratympanic surgery or treatment which might materially lessen the discharge or cause it to cease entirely. Polyps must be removed, sequestra must come away, fistulous tracts and pockets must be opened, adhesions broken down. If after such surgery is performed the discharge still continues, particularly if it be of a mucoid appearance, the tube should be closed. In such cases a good result should be expected.

In Dr. Yankauer's presentation, I was led to the conclusion that, given a case of chronic middle ear suppuration, all that was necessary was to close off the tube at the isthmus. This opinion was corroborated by the statement in his paper that "most of the patients had some favorite method of treating their ears * * * and they were allowed to continue the same form of treatment, more as a placebo than for any other reason. We may therefore state with logical accuracy that the results obtained were directly caused by closing the tube at the isthmus and by this alone." However, a close perusal of the description of his cases leads me to other conclusions, for it will be seen that in every case save those where nothing of pathologic significance was found in the tympanic cavity, some intratympanic manipulation was necessary. For example, he says in case II.: "Examination showed the presence of a large aural polypus filling the entire canal and obstructing the view of the middle ear. After shrinking the polyp with cocain and adrenalin, part of it was removed, sufficient to give access to the tubal region. The tube was then curetted. After the operation the discharge became mucopurulent, but was so abundant that another portion of the polyp had to be removed to obtain drainage. The patient was using instillations of alcohol which had previously been prescribed for him, and he was allowed to continue them, but applications of nitrate of silver were made to the polyp twice a week. The discharge from the ear became very slight and the polyp became gradually smaller. * * * Four months after closing the tube, examination showed that the ear had become quite dry and clean, the polyp having entirely disappeared." In another case the polyp was removed with the ossicles and the inner attic wall.

The questions which present themselves most manifestly to all of us are these:

1. Has the Yankauer operation any value if done with no other intratympanic manipulation?
2. In what class of cases is it distinctly of value?
3. Would a certain number of chronic suppurating ears cease discharging if properly taken care of medically and surgically, without submitting the patient to a closure of the tube.
4. Will the Yankauer operation, together with other intratympanic procedures, supersede the severe radical mastoid operation in many cases?

1. I think that certain cases which Dr. Yankauer has shown, and others operated upon by other men, will lead us to definitely state that this operation *per se* will clear up a great many cases which have persistently suppurated for years. Dr. Yankauer claims that there are certain cases which constantly become reinfected through the Eustachian tube. We are literally blowing our noses through our ears whenever a perforation in the drum is present. "The mere presence of a perforation greatly facilitates the communication between the middle ear and the nasopharynx, and all the changing bacterial flora of this infected region are constantly being added to the already existing sepsis in the drum cavity." In such cases, closure of the tube at the isthmus should bring about an absolute cessation of discharge. In other words, in that class of cases where the discharge is more mucoid than purulent, where no lesions can be found in the middle ear than granulation tissue caused by the discharge, we should expect a complete cure by the Yankauer operation.

2. In what class of cases is the operation of distinct value? Beside the class enumerated above, there are certain cases in which all polypi, dead bone, etc., have been removed and yet the discharge has persisted. To this class belong most of the cases cited by Dr. Yankauer. It has become an axiom of surgical practice that, given a pathologic perversion of tis-

sue, no cure may be expected without the removal of this tissue. I do not think it would have been possible for Dr. Yankauer, or any one else, to have effected a cure in any of the cases he mentions by merely closing off the tube and nothing more. Although a great deal of the ear trouble may have been caused by the constant reinfection from the nasopharynx, once the pathologic condition is present, nothing but eradication of the diseased parts will help to effect a cure. However, we have had the experience of not being able to stop an aural discharge entirely, even by the most painstaking care, and it is under such circumstances that the Yankauer operation fills a long-felt want.

3. Would a certain number of chronic suppurating ears cease discharging if properly treated medically and surgically, without submitting the patient to a closure of the tube? I believe this a mooted question. A great many of the men to whom I have spoken on the subject have claimed that they could cure 80 per cent of these cases by simple means—such as removal of dead products and cleanliness. Granted that they have the ability to do so, what shall be done with the other 20 per cent, which they cannot cure, except possibly by a radical operation? I am inclined to the belief that 40 of the 80 per cent could not or would not submit to treatment extending over months at a time. Patients who come to the clinic certainly would not benefit by such a delay. Economically, it is of a great deal of importance for such patients to get well as quickly as possible, and if the Yankauer operation will help them to get well in weeks instead of months, it is certainly a valuable procedure. Again, this other 20 per cent have no alternative but to submit to the radical operation.

4. Will the Yankauer operation, with other intratympanic procedures, take the place of the severe radical mastoid operation in certain cases? It is in this class of cases, I believe, that the chief value of the operation lies. There are any number of radical operations in which no necrosis is found in the mastoid cavity, in which the pathologic processes are distinctly confined to the middle ear cavity and attic. It is rational to suppose that cleaning the ear of all diseased bone, granulations, etc., by itself would effect a cure. But it has been within the experience of us all that such is not the case.

Moreover, the fact is so well recognized that the Eustachian tube plays an important part in these cases that a radical operation is not considered complete unless the Eustachian tube is curetted and closed off. In such cases, as Dr. Yankauer so aptly says, we should place the horse before the cart. One should clean out the middle ear cavity as well as possible, and also close off the Eustachian tube. If the discharge does not cease, see what has been overlooked, and if the tube is not closed, operate again. If after a reasonable length of time suppuration continues, it is still time to do a radical operation. Moreover, there are some few patients with suppurating ears who object to the radical operation. These patients are surely deserving of some attention, and, up to the present time, the operation proposed by Dr. Yankauer, taken in conjunction with other remedial measures, offers the best hope of relief.

I have offered these few facts in the form of an argumentative essay, in order to provoke a free discussion of the subject. None of us is in a position at present, considering the newness of the subject, to condemn the operation. It should receive the fair trial it justly deserves, and I believe that in time it will become one of our most important surgical procedures. I believe that every one of my cases has been improved by the operation, and that in the course of the next few months they will cease suppurating entirely. The only other alternative I could offer these patients would be a radical operation, and I could not be sure that the final results would not be as bad, or worse, than the disease itself.

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XIII.

THE PATHOGENESIS OF OTOSCLEROSIS: TREATMENT.*

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Otosclerosis, as a term, has been subjected to numerous restrictions ever since Tröltsch first united various pathologic entities under this denomination. At present it is confined to a definite group of aural lesions. These are characterized clinically by "progressive deafness," and recognized objectively by acoumetric constants, permeability of the eustachian tube, and a normal appearance of the drum membrane. The anatomic changes are: ankylosis of the oval window and stapes; osteitis, with spongy degeneration of the labyrinthine capsule.

In literature reference is made to otosclerosis as early as the eighteenth century, when Valsalva mentions among the causes of deafness, ossification of the annular ligament and ankylosis of the stapes in the niche of the oval window:

"Membranam per quam basis stapedis fenestrae ovali annectitur, illam non omnino immobiliter annectere probatum per observationem. In hanc Fenestram Basis Stapedis intruditur, quam exacte claudit, eique tennuis membranae interventu circumquaque adhaeret; non ita tamen stricte, quin sursum, deorsumve, ut opus est, per eamdem Fenestram noveri possit. Olim namque cujusdam surdi cadavere surditatis causam in eo sitam inveni, nempe quod indicata Membrana in substantiam osseam indurata, unum continuatum os constituebat cum Basi Stapedis et margine Fenestrae Ovalis; ideoque efficiebat, ne amplius sursum deorsumve eadam Basi moveri posset." (Valsalva, Tractact. de Aure humana, cap. II, par. 10.)

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In 1835, Toynbee called attention to the progressive rigidity of the stapedio-vestibular joint as a cause of deafness in otosclerosis. Finally, the question has been considered by the greatest specialists from a pathologic standpoint. Those wishing to familiarize themselves with the subject need but consult Denker's exhaustive monograph, which includes the greater part of the bibliography pertaining to otosclerosis and cites all the observations by which ankylosis of the stapes has been proven at autopsy.

Recent etiologic explanations have weakened the term otosclerosis, which does not coincide etymologically with the vascular spongefying process that, according to Politzer, Denker and Habermann, attacks only the labyrinthine capsule. If we must continue to assign an inappropriate term to this rarefying osteitis of the labyrinthine capsule, why not follow Sohier Bryant and call all chronic inflammatory, sclerosing processes of the mucous membrane covering the tympanic walls "chronic interstitial otitis"?

Some authorities combine otitis media hyperplastica or interstitialis with osteospongefying capsular labyrinthitis, claiming both to be stages of the same morbid process called otosclerosis. Sohier Bryant's theory opposes the pathology of otitis media hyperplastica rather than that of osteitis spongiosa. He claims, substantially, that the disease may begin with either an anemic or hyperemic condition of the entire drum cavity or of certain areas only, and that anemia or hyperemia may be primary or secondary. Cases of primary anemia are usually those of chlorotic women. When the condition begins with anemia there is atrophy of the mucous membrane followed by degeneration, calcification and fibrous atrophy. The tympanic membrane undergoes similar changes. When the condition begins with congestion—according to Sohier Bryant—we observe in succession: vascular proliferation, interstitial hyperplasia followed by contraction and compression of the vessels, anemia, degeneration and calcification. When the process affects the periosteum and bone, hyperostosis or osteoporosis may result. Sohier Bryant also believes that, from a pathologic point of view, otosclerosis is always the result of a nutritive vascular disturbance of the mucous membrane and periosteum covering the tympanic cavity. Because of the limited arterial supply available for the nutrition of the mucous membrane of the ear, circulatory disturbances of that organ are easily induced. And, also, because of the relation existing between its innervation and the tympanocarotidian plexus, the ear exhibits many variations of the blood supply in a restricted area.

This is certainly a very ingenious theory and explains that form of chronic otitis media which our school has baptized "otitis media interstitialis" or "hyperplastica." But postmortem examinations made upon those long afflicted with progressive deafness show that not all cases of otosclerosis present changes of the middle ear, but that each has a lesion of the labyrinthine capsule. These facts prove that the theory fails to corroborate the etiology of otosclerosis as described by Politzer and Habermann.

For twenty years classical manuals mentioned but one form of dry catarrh or hyperplastic otitis media accompanied by progressive deafness, thus confounding otosclerosis with a number of nonsuppurative cases of otitis media. Lucae, as well as Sohier Bryant, upholds tenaciously the theory that in the majority of cases, hypertrophic or suppurative inflammation of the tympanic cavity is the cause of otosclerosis. He believes that in otosclerosis there is a tendency to disregard a transitory suppuration which has occurred during infancy or adolescence. Long ago chronic, nonsuppurative inflammations were supposed to result from severe chilling, and it was believed that these, instead of resolving, engendered sclerosis of the mucous membrane of the tympanum and produced rigidity of the ossicular chain involving the tympanic membrane, the ligaments of the stapes and the membrane of the round window. In conclusion, Lucae is disposed to admit that in certain cases there is a primary lesion of the labyrinthine capsule. He believes that a scrupulous otoscopic examination, with the employment of perfected diagnostic methods, would notably reduce the number of cases of true otosclerosis and that the majority of cases would be grouped under simple, hyperplastic middle ear disease of tympanic origin. In fact, until recently, all chronic middle ear inflammations characterized by paracusis, progressive deafness and vertigo were classified under the obscure term "dry middle ear catarrh." One feels, therefore, the necessity of subdividing this group and making a classification of the various morbid entities on the basis of (1) pathophysiologic researches conducted on the ears of the deaf; (2) improved and more accurate otoscopic and functional tests, and (3) researches in etiology.

In the first place we distinguish a group of chronic middle ear inflammations which, though not caused by acute inflammation, present phases of old dry catarrh and are caused by stenosis of the tube. This condition induces hyperemia and inflammation of the mucous membrane in the tympanic cavity, together with hyperplasia, hypertrophy and synechia. These changes proceeding from hyperemia through hyperplasia and which may end in atrophy, constitute a separate class of tympanic affections, having nothing in common with the inflammatory processes. We are astonished at the ostracism imposed on the term "middle ear catarrh," which characterizes this class of chronic affections of the tympanic cavity.

The symptomatology of middle ear catarrh is very analogous to that of otosclerosis. There is, however, an essential difference in the results of treatment. Up to the present time treatment has frequently been successful in cases of the first class—middle ear catarrh—while it has remained absolutely negative in those of the second class—otosclerosis. In the first group we find the middle ear catarrhs of the gouty, the diabetic, the albuminuric; those coming from circulatory troubles in Bright's disease, the cardiacs, cirrhosis of the liver and arteriosclerosis; those observed in leukemia and the sanguine discrasias; those of Basedow's disease, or those caused by disturbances of the great sympathetic. (Angioneurosis.)

The progressive deafness appearing in the course of pregnancy and lactation is, in part, due to middle ear catarrh. Still, the majority are cases of true otosclerosis whose morbid entity has been recognized from a patho-anatomic point of view, independent of the labyrinthine capsule in which it originates.

Politizer says that classical otosclerosis is a primary affection of the labyrinthine capsule, which localizes principally near the oval window. He maintains that the new-formed bone substance does not originate in the periosteum, but in the labyrinthine capsule. His theory is based on the following data:

(1) A great number of sections from the promontorial wall showed that the recent osseous process did not pass from the periosteum to the deeper bone; but that the osseous disease extended uniformly through parts of the labyrinthine walls.

(2) Circumscribed islands of new-formed bone were sometimes found in the deeper regions of the normal bone, with normal bone between them and the periosteum.

(3) In typical cases of otosclerosis the mucous membrane of the tympanum and periosteum showed not one lesion.

On the other hand, after examining the temporals of two otosclerotic subjects, Habermann states that the new osseous formation originated in the periosteum and only later invaded the labyrinthine capsule. He believes that in such cases otosclerosis has little foci—circumscribed centers—having for their point of departure the borders of the round and oval windows at that point where the periosteal vessels enter the bone. The osteitis ultimately affects nearly the entire capsule, but never the membranous labyrinth.

Histologic examination showed that the capsule presented characteristics of the vascular osteitis of Volkmann, with numerous dilated capillary vessels and osseous rarefaction, especially in recently involved portions of the labyrinthine capsule. The parts longest affected were the seat of new-formed dense bone. Katz, also, after examining numerous histologic preparations from an otosclerotic cat, concluded that the malady has its origin in the periosteum of the drum cavity.

From microscopic examinations of the labyrinthine capsule of an otosclerotic patient, Jörger Möller recognized normal tissue as very distinct from foci. In the latter, the recently formed osseous lamellae, instead of being straight, showed irregular curves surrounding the numerous vessels which were much larger than the Haversian canals of healthy bones. The new-formed vessels made an extended plexus in these medullary canals. Along the walls of this cavity abundant osteoblasts were found, as well as many osteoclasts in its central parts. Where the osteitis seemed oldest the osseous lamellae were thin and the medullary canals were surrounded by a fibrous coat containing few cells and sparse vessels. In view of this examination, Jörger Möller admits with Politzer that otosclerosis consists of a new formation of osseous tissue whose tendency is to replace the normal tissue, which, in the later stages, is largely absorbed, forming osteoporosis. On one point I agree with Moos, Bezold, Scheibe, Politizer, Edm. Hartmann and Siebenmann, who have studied the subject thoroughly. I refer to the exclusion of the hypothesis that otosclerosis is secondary to changes of the tympanum. It is a primary lesion of the stapes, the oval window and labyrinthine capsule.

Katz and Habermann besides the labyrinthine capsule include the head of the hammer and the body of the incus among the bones attacked by otosclerosis; but I found no lesion in numerous histologic sections of ossicles taken from otosclerotic subjects. I found the bones rachitic and osteomalacic.

For example, in comparing two preparations—one of the hammer and incus of a normal subject, the other of the same bones taken from an osteomalacic woman—from a histoanatomic point of view, we find no differences. This supports the fundamental idea of Politzer that the lesion primarily attacks the capsule and not the middle ear. If, on the other hand, it were found that the hammer and incus participated directly in the morbid process, we should be obliged to admit that sometimes otosclerosis is a secondary manifestation.

To sum up, if the lesion is recent, the microscopic examination of the bone areas affected by otosclerosis would show the presence of osteoid tissue; if old, spongy tissue would be found. In the new-formed osteoid tissue we would find a great number of medullary spaces filled with cells, of which some would be giant cells containing many nuclei. Generally there are, in various localities, bony canals for the blood vessels which are full of blood corpuscles, while in others the vessels are free of corpuscles.

To differentiate between hypertrophic or interstitial middle ear inflammation and otosclerosis one must observe certain diagnostic points besides the otoscopic examination (which in the latter case will show the integrity of the tympanum, except for a slight congestion of the mucous membrane of the promontory). These points are well explained by Shambaugh, who considers them characteristic of the disease. In otitis hyperplastica interstitialis the functional disturbances are always limited to the transmitting apparatus; whereas, in labyrinthine capsulitis other changes were added. These—a weakening of sound perception and faulty equilibration—are caused by osteitis spongiosa of the corresponding portions of the capsule. Cases of otosclerosis are constantly seen in which there is no obstacle to sound transmission, while there are definite acoustic disturbances as well as disturbances of equilibrium.

Shambaugh distinguishes three distinct classes of otosclerosis. In the first group the auditory disturbance is due solely to the rigidity of the stapes. Consequently diagnosis is simple, even at the beginning of the disease. The bone conduction is prolonged, Rinne test is negative and the low limit of tone perception is raised.

The second group includes those cases in which ankylosis of the stapes plate is accompanied by auditory disturbances, more or less marked in proportion as the labyrinthine capsule is involved. The osteitis spongiosa does not always originate in the immediate vicinity of the oval window. Disturbances of equilibrium are found where the bone changes near the vestibule are aggravated. On the other hand, if the cochlea is more directly affected there are functional disturbances of that part of the organ of Corti which is to some extent connected with the diseased part of the capsule.

Shambaugh explains how, in certain typical cases of otosclerosis, there can be a gap in the perception of the high notes of Galton's whistle, when neither fixation of the stapes nor disturbance of the conducting mechanism is present, because a portion of the labyrinthine capsule, in the neighborhood of the oval window, is attacked primarily, and consequently disturbs that part of the organ of Corti which is beneath the promontory.

Bezold described cases in which, besides the ordinary indications of otosclerosis, the auditory gaps are limited to the middle notes of Galton's whistle. This condition is never found in hypertrophic or interstitial otitis.

The third group are those cases in which the footplate of the stapes remains movable (a condition which is never seen in hypertrophic middle ear inflammations), and in which it is probable that the osseous spongefying process affects the basilar whorl of the cochlea. Without the findings of a postmortem examination, such cases are very embarrassing, as they may be mistaken for those of nerve deafness. One must, therefore, note not only the marked rise in low tone perception, but also the defect in perception of the higher tones of Galton's whistle.

After reviewing the recent opinions of the best known writers on the nature of the morbid process which marks otosclerosis, and after having established a definite distinction between otosclerosis and middle ear interstitial inflammations —whether hyperplastic or dry—we approach the etiology of the disease which has caused so much discussion.

Until now, authors have expressed the most diverse opinions concerning its causes, assigning as such: rheumatism, gout, neuroparalytic heredity, ozena and syphilis. Gradenigo, Siebenmann and Habermann have said that it is a parasyphilitic affection, and they prescribe antisyphilitic treatment for all cases of otosclerosis. This hypothesis of the spongefication of the labyrinthine capsule seems somewhat doubtful. Even when the Wassermann reaction is positive, we must suppose that the contagion has merely contributed to a latent, incipient affection. It has been shown that hereditary syphilis in its termination almost always attacks the auditory nerve, together with the middle ear and labyrinthine capsule. The hypothesis that otosclerosis is an autotoxic hematogenous disease has gained ground.

It is said that in certain countries, England and Southern Italy for example, where a gouty heredity predominates, cases of primary otosclerosis are often seen. Gout must not be excluded from the etiologic causes of the malady, particularly as the gouty lesions which attack the articulations, auditory canal and auricle may show themselves in the form of otosclerosis followed by rarefaction in the niche of the oval window, causing obstruction to the movements of the stapes. Many cases of otosclerosis seen in gouty subjects cannot be imputed directly to the latter condition, but must be attributed to a state of autointoxication of the organism, whose presence is exhibited by lithemia and cholemia. Why not include osteomalacia and rachitis among the probable causes of otosclerosis? Both of these, according to recent researches, are of infectious origin.

From every point of view we can admit that autointoxications are frequently latent or hereditary. This hypothesis explains the appearance of otosclerosis among certain patients at special periods of their lives, when the general nutrition is undergoing profound changes. For instance, among the rachitic when the skeleton is developing, and among osteomalacic women during pregnancy and prolonged lactation. Considered etiologically, the only causative factor positively recognized is the predilection of otosclerosis for the female sex. This view precludes the influence of rhinitis—often cited as an etiologic factor in ankylosis of the stapes, when actually it acts only as an aggravation of a morbid process already present.

In many cases of congenital deaf-mutism, loss of hearing is due to an early attack of capsular labyrinthitis developed during the fetal period coincident with maternal autointoxication, or infection of some other nature, such as that of rachitis or osteomalacia. The latter diseases have recently been shown to be of diploccocic origin.

Politzer was the first to suggest a relationship between otosclerosis and the puerperium, but we think he was mistaken in considering otosclerosis a true infectious puerperal osteitis. Hanau is more exact in saying: "We must not be surprised if the frequent lesions of the skeleton during the puerperal period attack the cranial bones, including the temporal." In order to explain the relative frequency of otosclerosis at this period, Habermann insists that conception and the commencement of the syphilitic infection are simultaneous, and concludes that in most cases syphilis is the cause of otosclerosis. T. J. Harris explains the part played by pregnancy as a predisposing factor by the relation existing between the sexual and the sensory systems. This theory, however, seems far-fetched. It would be better to take into account two more important factors, very intimately related; rachitic heredity and osteomalacia.

Lucae in 37 per cent and Bezold in 52 per cent of their cases demonstrated the influence of heredity in the etiology of otosclerosis. These figures are very significant to those who attribute the disease to osteomalacia and rachitis (which are hereditary diseases), rather than to syphilis. Siebenmann corroborates this origin of otosclerosis and attributes hereditary otosclerosis to an anomaly in the development of the embryonic ear. As a matter of fact, rachitic lesions are sometimes recognizable in the newborn; it is possible that these lesions may have already affected the labyrinthine capsule. In a short article which was favorably received, we tried to demonstrate that repeated pregnancy exerts a prejudicial influence in the case of aural sclerosis and syphilitic labyrinthitis, whether inherited or acquired.

Milligan also maintains that pregnancy may aggravate progressive deafness caused by hyperplastic otitis media and capsular labyrinthitis. Referring to the capsulitis, which is nearly always bilateral and most often attacks young pregnant women, he gives vague observations, alluding only to an infected condition of the organism. He says that since elimination is not regular, the blood always contains toxins, which condition brings about dystrophic processes of the osseous labyrinth, the membranous labyrinth and the nerve terminations. All this is very superficial. In the same way we can dispute Birkett, who believes that the aggravated deafness of pregnant women is found among those only who show lesions of the labyrinthine capsule.

The writer claims the priority of his opinion expressed in an article on "The Influence of Pregnancy on Acute and Chronic Changes of the Ear" (*Arch. Ital. di Otol.,* vol. XIX, Fasc. 3, 1908): "As to the nonsuppurative changes of the middle and internal ear (which may first show themselves or be aggravated during pregnancy), contrary to many aurists, we are persuaded that, from an etiologic point of view, these should not be confounded with changes of the same kind sometimes appearing during lactation. These nonsuppurative changes are usually the effect of hematoxic retention in the auditory organ of pregnant women, and the probability is good that they will lessen and disappear after confinement. Other changes have a much more uncertain prognosis, being of neurotrophic origin and in reality related to anemia of the nerve centers."

The recent etiologic conceptions of osteomalacia and rachitis have called our attention to otosclerosis during pregnancy, and have led us to suspect that osteomalacia may be the origin of the evil, just as early otosclerosis in the young may be of rachitic origin. The infectious theory of these two diseases tends to confirm their close relationship, which, according to Arcangeli, should be proven by epidemic and clinical observations and anatomico-pathologic researches. Apropos of the close affinity of these two diseases of the osseous system, the writer has noted that they often follow an endemic course in the same country, and that they are increased by special conditions. It is frequently found that rachitis is common among the children of osteomalacics who have had the former disease in infancy. Rachitis often precedes maternal osteomalacia, yet the reverse is equally true. Among the extreme cases of classic rachitis and osteomalacia of pregnancy there are ill-defined forms which show similar fundamental characteristics.

Morpurgo infers, on the basis of histologic examinations of the osseous tissue, that osteomalacia and rachitis are more or less exaggerated manifestations of a single process. Artom excised pieces of rib from osteomalacic women and rachitic children and found that almost identical micrococci developed in various media from cultures of these bones. Schmorl has produced rachitis in white mice by injecting into them the medullary substance of osteomalacic mice. Morpurgo has inoculated white rats with osteomolacic material. Each case resulted in the development of osteomalacia or rachitis, according to the age of the animals. Artom inoculated adult white rats with diplococcus taken from rachitic children without exciting an inflammatory action at the point of injection or a general reaction (diplococcus not being pyogenic), but he observed at the end of two or three months that the animals were affected by motor disturbances. Radiography showed extensive alterations of the bones—rarefaction and fractures. He proved by microscopic examination that these lesions were analogous to those obtained by inoculating mice with osteomalacic material.

No one can deny the importance acquired by the theory of the infection of osteomalacia in revolutionizing our ideas on the etiology of otosclerosis. The evidence, from a clinical point of view, makes us suspect that an infectious condition of the organism directly affects the osseous system, and that, in certain subjects, because of hereditary peculiarities, the infection begins, by preference, in the temporal bone and labyrinthine capsule.

Arcangeli's doctrine of the pathogenesis of rachitis and osteomalacia has won over the writer, who hopes that in Italy, where the two diseases are so common, aurists will become interested in the spread of otosclerosis. Above all, the relationship must be established between otosclerosis and these two diseases, and researches must be made in countries where the former is endemic, so as to recognize the cause of progressive deafness and to establish as to whether a lesion exists in the auditory organ early in the life of the rachitic child. Finally, a study must be made of osteomalacic heredity or the rachitism of the otosclerotic.

Recent studies on the pathogenesis of osteomalacia bearing on the diplococcic infectious origin of the disease, and the confirmation of this theory by the transmission of human osteomalacia to white rats, have drawn our attention to the predilection of otosclerosis for the female sex and especially pregnant women.

Because of the great number of osteomalacics seen at the obstetric clinic of Professor Arcangeli, it occurred to the writer to observe those cases in whom the search for diplococcus had proved positive, and whose isolated diplococci, when injected subcutaneously into white rats, had produced either osteomalacia or rachitis, according to the age of the animals.

The writer soon discovered that even those patients who upon superficial examination had shown no signs of abnormality in audition exhibited very marked auditory disturbances after careful functional tests. Two of them were so severely affected that we brought them to the otologic clinic for treatment. One underwent ossiculectomy of the hammer; the histologic examination found this ossicle normal. In another case a fragment of rib was taken out, and a subcutaneous inoculation was made from it into the backs of white rats. Three months later they presented typical osteomalacia. What is of particular interest to us is that in radiograph of a normal and a malacic rat taken on the same plate and in the same position, the latter animal showed evident rarefaction of all the cranial bones, and especially of the labyrinthine capsule.

In all the osteomalacic patients seen at the obstetric clinic the chief auditory changes were: Marked diminution in hearing; persistent, irksome auricular sounds; occasional headaches and vertigo. Functional tests were conducted with great scientific precision. Tests made with tuning forks, as well as with the watch, the voice, and Galton's whistle showed that the changes were beyond the middle ear and were localized in the internal apparatus. This opinion is confirmed by the otoscopic examination, which gave no evidence of the pathologic changes commonly attributed to a lesion of the conductive mechanism. Slight tympanic changes were observed in some patients, which in no way accounted for the auditory functional disturbances. The functional results obtained by the Rinne and Galton showed these changes to be of no importance.

Finally, in order to confirm the localization of the disease in the internal ear, allow me to add that the rhinopharyngeal examinations were negative in finding any of the alterations generally considered causative of middle ear disease. Therapeutics also have proved our theory.

Our theory has been proven therapeutically. While at the clinic the patients received osteomalacic treatment, i. e., Wright's vaccine, which as a rule consisted of the diplococcic culture taken from the patient. The result was usually most satisfactory; there being a decided general improvement as well as an improvement in hearing. These researches enabled me to demonstrate that many cases of otosclerosis in women originate from an infectious process analogous to that of osteomalacia. The lesions are best described under the denomination of "osteomalacic capsular labyrinthitis."

We hope that progressive otology will eventually find a means of curing or more or less checking this grave disease of the ear. It must be admitted, however, that up to the present none of the proposed methods of treatment is beyond criticism. Concerning the present treatment of otosclerosis, one can apply to it Alembert's judgment of medicine in general, expressed in a letter to the King of Prussia: "I would have recourse to it as late as possible. I consider it the sister of metaphysics because of its uncertainty."

By good fortune a knowledge of the pathologic anatomy of otosclerosis has contributed to the renown of otic therapy. The fact that this has demonstrated that the affection involves only the labyrinthine capsule and almost never, or only secondarily, the membranous labyrinth, makes us forget the mistakes of the apostles of mobilization and extraction of the stapes through the auditory canal or after the mastoid operation. Such surgical interventions would be justified if, as earlier authors believed, otosclerosis were concerned with chronic middle ear inflammation, and if the histologic changes of the labyrinthine capsule (according to Habermann) had not shown that osseous lesions are not as extensive on the surface as underneath.

This osteitis is characterized by foci, limited as a rule to two or three, rarely more. In these osteitic lesions the oldest and least severe is found near the periosteum, and those most recent and extensive near the endosteum of the labyrinth. We have learned that the interventionists have made a false move, and that in attempting the amelioration of progressive deafness it would be better to be guided by recent etiologic investigation.

Since it cannot be denied that certain cases of otosclerosis are brought about by heredity or acquired syphilitic infection, it is logical to have recourse to specific medication, especially where the Wassermann test is positive. In cases where the cause of the disease is related to a gouty diathesis it is necessary to use the means put at our disposal by general medicine.

Periods of prolonged intermission have been noted as well as temporary amelioration, which has phases of recrudescence and remission, especially at its beginning. These phases occur before the deformities and the spongy lesions of the bone of the labyrinthine capsule in particular have acquired stability.

Forms of otosclerosis are also seen in cases of grave glycosuria, where the increase of sugar in the urine aggravates the otosclerotic symptoms, and it becomes necessary to follow a stricter régime and resort to inhalation of oxygen and tonic medication. Mineral phosphates or the organic preparations are especially indicated. The writer advises the use of Wright's vaccine in the treatment of otosclerotic women. When young people are afflicted with otosclerosis I have no hesitation in attributing it to hereditary rachitis. In such cases I advise the use of subcutaneously injected vaccine from the bones of rachitic children; for it has been found that morphologically the diplococci of rachitis and otosclerosis are similar. I adopted this course in treating three girls, from fifteen to twenty years of age, who showed evident signs of hereditary otosclerosis and rachitis. They were vaccinated, no change was made in their habits of life, and no medication other than the subcutaneous injections was used. Following the experience of authorities who claim a far more effectual action for the vaccine when injected in the neighborhood of the morbid process, inoculation was made per tubam. It may be a long time before we can attribute real amelioration to this vaccination cure, but until now no other treatment has given any favorable results; moreover, Wright's vaccination is harmless.

I fully expect my theory of the pathogenesis of otosclerosis to meet with opposition, but I hope to be able to justify my views by further researches and experimental control. If, as I hope, the new endeavors support my theory, I believe they will be of genuine therapeutic value in furnishing a more definite diagnosis and in limiting tympanic surgery, which is now frequently undertaken where the indications do not justify it.

XIV.

SOME REMARKS ON SINUS THROMBOSIS WITH PARTICULAR REFERENCE TO THE DIAGNOSTIC VALUE OF BLOOD CULTURES IN OTITIC DISEASE.* †

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The intimate topographic relation existing between the vascular sinuses of the cranial cavity and the temporal bone brings into prominence suppurative diseases of the middle ear and its accessory osseous chambers. An extension of purulent inflammation to these large venous channels is not infrequent, and as its symptom complex is often atypical, great difficulty is encountered in correctly and promptly appreciating the resultant complication. In addition to the superior and inferior petrosal, cavernous and lateral sinuses, the jugular bulb, the internal jugular vein and its neck tributaries, and the smaller veins of the cranial contents perforating the osseous structures in various directions, all play an essential role in localized infections here, and the phlebitis associated with a suppurative otitis, whether acute or chronic, depends in large part for its symptomatology upon the relationship of these structures one with another.

It is, however, in this study with the lateral sinus, and particularly its sigmoid portion, that we are especially concerned, as it is in this venous channel that infection by far most frequently takes place from the middle ear and mastoid cells. In every case of mastoiditis, lateral sinus thrombosis is always a possible sequela, and on account of its relatively high mortality, with the absolute necessity for a serious operation to prevent general pyemia, all factors that will in any way aid in its early recognition should receive the most careful attention. As a result of the varied and irregular conformations of the temporal bone, the location of the sigmoid sinus also varies greatly, and I am sure that the development of an infected thrombus at this point bears very closely along anatomic lines, as where the sinus is separated from the mastoid process by a thick, noncellular posterior and inferior wall, there is much less danger of infection than when it is well forward in relation with the posterior wall of the external auditory canal, and the adjacent tympanic areas are intimately connected with it by means of the abundant vascular supply. By no means is the anatomic location of the sigmoid sinus fixed, and while in operating on the mastoid process one expects to find the involved portion of the sinus just posterior to the antrum and about one-half inch posterior to the posterior wall of the external auditory canal, yet this location is far from constant, and, as I have before stated, there is probably no important portion of the temporal bone which is so uncertain in its location.

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†I desire to express my thanks to Drs. Libman and Celler of the Mt. Sinai Hospital laboratory for their interested co-operation with me in the above work.

In the study of the sinus in relation to infective thrombosis and its recognition by the valuable aid of blood cultures, a clear conception of its relation to the antrum, which is undoubtedly the remaining focal point of the purulent collection, especially in chronic suppurative otitis media, is most essential. As has been pointed out before, the distance between the sigmoid sulcus and the antral wall rarely exceeds five millimeters, so that in operating for the exposure of the sinus, unless there is a direct osseous fistula, which, of course, at once locates its position and its relation to the focus of primary infection, this point must always be kept clearly in mind. In the majority of cases, especially when the mastoid cortex is thick, the osseous tissue is apt to be thin in the region of the digastric fossa, while, on the other hand, where the mastoid process is small in size, the lateral sinus will often encroach upon the antrum. Again, when the sinus is large and bulbous, it comes in closer contact with the cortex and the posterior canal wall, so that the opportunities for infection are more enhanced in this type of mastoid when the parts are the seat of a purulent infection.

In a general way, it may be said that the sinus may be placed in either one or two positions relative to the antrum bearing on the development of infection. In one, its groove may be unusually deep, so that this enlargement of the channel lessens the thickness of the strip of osseous tissue separating it from the antrum, or the groove may be placed far anteriorly so that the sinus is brought immediately internal to the antrum. Rarely it may even be in front of it, so that the antral space will be narrowed from without inwards and the relationship between the two present a most intimate type.

The great problem of sinus thrombosis to the otologist is not so much in etiology or in operative technic, but in the early recognition of infection of the sinus, and with the usual symptoms as they appear this is often a most difficult and many times an almost impossible problem, it being in such cases that a study of the blood cultural characteristics in the so-called atypical type of infection presents its greatest value, as will be seen later, practically enabling one to decide whether or not a sinus thrombosis is present, or whether some infection elsewhere is the basis of the presenting symptomatology. Without minimizing the risk of operation in purulent lateral sinus thrombosis, which is considerably enhanced when the extent of the operative field is increased by added jugular involvement, in every case the danger increases greatly as each day passes with the affection unrecognized, or when the surgeon in the face of variable symptoms that are not characteristic hesitates and delays operation.

Undoubtedly the opening of the sinus as an exploratory measure, in the presence of a mastoiditis without fairly positive indications, is not to be considered good surgery, and warning must be raised against too energetic operation under such circumstances. One should be reasonably sure of sinus involvement before operation for its relief is undertaken, and the sinus should not be opened on suspicion, but operation should be performed in either acute or chronic mastoid disease accompanied by characteristic phlebitic symptoms, such as chills, sweats, wide excursions of temperature and pulse rate, and especially where the infection is of the streptococcus type and where there is a significant differential blood count. Where all or a greater number of these characteristic symptoms are present no doubt exists that the purulent focus in the sinus should be attacked at once, but unfortunately in many cases the symptoms are not in any way characteristic in the early stages of its development.

The clinical study of the temperature variations is extremely important, especially in typical cases, where a high temperature of a septic type with wide variations should always suggest infection of the large venous channels. A temperature of 105 degrees or more, depending upon the amount of septic material that is being disseminated throughout the general circulation, rapidly followed by a sudden and violent drop to normal or subnormal within a few hours, is the characteristic of the typical case. The frequency of these temperature variations depends entirely upon the amount and virulence of the septic material that is escaping from the sinus focus, and while there may be but one rise and fall in twenty-four hours, there may be several such fluctuations during the day. Closely associated with the variations in temperature, yet observed only in a comparatively small percentage of cases, is the occurrence of definite chills severe in type and coming on previous to the rapid rise in temperature. Neither the rise and fall of temperature nor the preceding chill, however, are typical in themselves of a thrombosed sinus, as they occur in practically all grave septic conditions and simply indicate that a certain amount of infectious material is being distributed throughout the general circulation. Even in the majority of typical cases, however, no such marked chills occur, and this symptom might be considered as absent, unless a most careful watch of the patient is kept, when from time to time slight creepy or chilly feelings are present. Sweating may or may not follow these apparently minor chills, but is usually profuse after a severe chill and high rise of temperature.

Especially following the mastoid operation may these chilly sensations be complained of, and they are symptoms deserving consideration, particularly if the case is of the atypical type.

The pulse rate and respiration in cases unaccompanied with other intracranial complications, such as brain abscess, generally keep pace with the rise in temperature, but this is not in any way characteristic and does not aid one in establishing the diagnosis, even in otherwise typical cases. Should nausea or vomiting or both be present, and they are frequently absent, they are, like the other symptoms enumerated, in no way characteristic, but they merely indicate that a septic infection of a severe grade is present. In the later stages of a purulent sinusitis, with the patient markedly septic, both nausea and vomiting are almost invariably observed and are accompanied by the other general symptoms of a septicemia or pyemia, such as digestive disturbances, loss of appetite, heavily coated and foul tongue, a sallow, dry skin, etc. The eye symptoms afford no indication of the particular lesion present, but the pain over the affected side of the head, which is often most severe and even greater than that in an uncomplicated mastoiditis, is highly suggestive, and especially so when there is severe occipital pain or pain along the course of the internal jugular vein.

Locally one may find more or less edema over the mastoid process in the region of the emissary vein. McKernon calls attention to a most important diagnosic sign when sinus thrombosis is suspected after a mastoid operation has been performed, the healthy appearance of the mastoid wound in the early stages of the disease, excepting over the bone of the inner table forming the sigmoid groove, which is darker in color over the thrombotic area, and granulation tissue has not developed at this point. In cases where the sinus is exposed at the time of the mastoid operation without prior symptoms as a guide, the physical condition of the exposed sinus may be of value in determining its condition, that is, it may be flat, compressible or lusterless, and the dura over it may be grayish or yellowish in color, but, however, the physical examination does not always make clear the pathologic changes that are taking place within the sinus, as its external walls may present some of these signs and yet its intima coat and lumen be perfectly normal.

It has been considered in many cases that a blood count, especially an increase in the polynuclear percentage to over eighty, indicates the presence of a focus of pus, from which the general circulation is being infected. In many typical cases this is essentially correct, and such a count is of value in arriving at a diagnosis. In many cases, however, in the experience of every otologist, the blood count is of little or no value in correctly interpreting the condition present, as the polynuclear percentage may be high and yet no sinus disease exist, or the reverse may be the case. Dench clearly estimates this factor when he says that the differential blood count in sinus thrombasis is unsatisfactory, as he has seen a number of cases with a normal count. In one case of thrombosis of the internal jugular vein with suppuration of the supraclavicular glands of a most severe type, the polynuclear count never rose above eighty per cent. However, it must be borne in mind that the absence of a high polynuclear count does not necessarily mean that there is no clot in the sinus or jugular vein.

A symptom which I have frequently observed in connection with the early development of sinus disease and one which I have never seen described is the occurrence of a unilateral lateral lymphoid pharyngitis or tonsillitis associated with a unilateral adenitis. This adenitis is usually most pronounced beneath the angle of the jaw and at the site of the junction of the facial vein with the internal jugular. The occurrence of a chill and rapid rise in temperature with slight difficulty in swallowing led to the examination of the throat, and in several instances the objective findings seemed at the moment to form a basis for the diagnosis of a pharyngeal or tonsillar inflammation as the causative factor of the symptomatology.

As is well recognized by otologists, the early diagnosis of sinus thrombosis and atypical cases, at any time during their course, cannot often be made by the symptoms which may or may not be present and which have been here outlined. As a result of this uncertainty and the desire to combat the affection by surgical measures at an early stage, where operation affords the greatest hope of relief and cure of this serious infection, much clinical and laboratory work has been done. As a result of various investigations, especially work done abroad by Leutert, Lenhart, Neurnberg, Kobrak and Hasslauer, an early and accurate diagnostic sign, that of the study of blood cultures, has been worked out along practical lines, and the otologist is now in a position to state definitely, in the vast majority of cases, whether sinus thrombosis is present or not, and thus an opportunity is offered for early operation to remove the purulent focus before the general system becomes the seat of serious pyemic infection.

Leutert states that during the course of a suppurative otitis the appearance of great quantities of streptococci in the blood of the lateral sinus confirms the diagnosis of sinus phlebitis, especially when other febrile diseases are not present. In order to ascertain the presence of a thrombus in the sinus he advocates that blood cultures be taken directly therefrom. The significant preponderance of streptococci in the blood of the sinus, as compared with that obtained from the peripheral venous system, will determine in doubtful cases whether the high fever which is present in the given case is to be ascribed to the aural condition or to some other disease. If there should be a larger number of streptococci in the blood of the sinus, while a smaller number appear simultaneously in the peripheral veins, and if other febrile disease can be excluded, this condition confirms the diagnosis of sinus thrombosis. A negative culture from the blood of the sinus and also from the peripheral veins does not exclude a sinus thrombosis with certainty, as in such cases he states there may be an isolated thrombus of the jugular bulb, and if a deep puncture is not made, a negative culture may be obtained in spite of the presence of a thrombus. In such cases the temperature is a valuable guide in diagnosing the affection, or one may wait two or three days and then repeat the puncture in a deeper place, but this delay should be only in fairly acute cases, because he states that in cases of longer duration the bacteria may greatly diminish in number from the gradual disintegration of the thrombus, when the clinical symptoms will be those of the predominant metastatic foci in various portions of the body. In case both sinuses are involved a septic thrombus is assumed to be present in the one in which streptococci are found either alone or in preponderating numbers. If the number of colonies is about the same from each side, but that in a peripheral vein markedly less, a bilateral sinus thrombosis is present.

Kobrak in a study of 20 cases of acute otitis media accompanied with a rise of temperature, always obtained negative blood cultures, while in cases of marked severity, positive results were obtained only if the fever was pyemic in character. In 11 positive cultures he found streptococci in the blood 7 times, and in 28 cases with streptococcic infection of the middle ear there was general infection in 7, while in 17 cases with local pneumococcic infection this organism was found in the general circulation in but a single instance.

Neurnberg in his original work examined the sinus blood in five cases of thrombosis and found streptococci in each, and by this means he was able to differentiate otitic sinus thrombosis from other febrile affections at an early stage before local manifestations developed. In one patient with a high temperature coming on one week after a mastoid operation and evacuation of a brain abscess, six days after childbirth, the question arose as to the cause of the fever, as it might have been due to incipient mastitis, puerperal fever, meningitis or sinus thrombosis, but absence of other symptoms seemed to exclude the first three as being present. On account of the negative bacteriologic findings in the blood of the sinus, operation was postponed, but as the symptoms increased in severity the negative blood cultures were disregarded and preparations were made to open the sinus, when an erysipelatous inflammation developed, thus clearing up the diagnosis. As a result of his experience, therefore, he states that negative cultures from the sinus blood should exclude sinus thrombosis, or at least they should justify postponing operation, and that the puncture to obtain the blood must be made deep and close to the bulb of the jugular vein and during a period of temperature rise, otherwise the danger of obtaining a negative result, even should a thrombus be present, is very great, and especially so in case there is an isolated thrombus of the bulb of the internal jugular vein.

From a careful study of the work of these otologists it becomes very evident that a positive blood culture, in the presence of a purulent otitis media, where infection from other sources can be excluded, is indicative of involvement of the lateral sinus by a septic infection, and in a study of over 100 cases of mastoiditis which we have made, a negative result from blood cultures was always obtained in uncomplicated cases, while in 50 cases of involvement of the lateral sinus there were 42 positive results from blood cultures prior to operation. In four the first culture was negative, but the second culture was positive. As I have stated, on a previous occasion, the otologist should not necessarily depend on the laboratory for the diagnosis of a sinus thrombosis, yet a blood culture as a definite part of the examination might be well considered a necessity, such a culture being taken at the time of the mastoid operation, and as a result of my experience this has conclusively demonstrated that mastoid disease per se does not produce a bacteremia. Illustrative are the following cases:

Female, 12 years of age. Complained of pain in the left ear and a slight purulent discharge for two weeks. I first saw her in consultation when she was unconscious, with a temperature of 106.5 degrees and an acute mastoiditis, with the physical conditions indicative of intracranial involvement. Double Kernig and McEwan signs. Blood culture showed streptococci, and immediate operation was advised. The entire mastoid was removed, the sigmoid sinus plate was found necrotic, and its removal exposed a contracted sinus which, with the mastoid emissary vein, was thrombosed. There was a fistula in the roof of the antrum, and about two drams of greenish pus under great pressure were evacuated. The dura was congested, bluish-black and was bulging. It was incised. The brain was found much congested and friable, with adhesions over a large area. The vertical limb of the sigmoid sinus was then incised and a fresh clot was removed, which was followed by the escape of blood from both ends of the vessel. Blood culture showed four colonies of streptococci to each cubic centimeter. There was a polynuclear count of 90 per cent and a leucocytosis of 31,000. A blood culture taken two days later was sterile, and the patient, after passing through an acute encephalitis, entirely recovered.

Female, 22 years old. Grippe, followed by perforation of the left membrana tympani, and four days later it was necessary to incise the right drum membrane. Suddenly high temperature developed, with vertigo, nystagmus, nausea and vomiting, and symptoms referable to mastoid involvement. Cerebration was slow, the tuning fork showed diminished higher tones. The left mastoid was opened and the sinus exposed, which latter appeared normal. Two days later the right mastoid was operated upon. The sinus was well forward. There was a leucocytosis of 19,000, temperature 104 degrees, polynuclear 86 per cent, and five colonies of streptococci to the cubic centimeter. There were chilliness, restlessness, headache and nausea, and I determined to explore the sinuses. The left was normal, while the right was thickened, striated, and on incision there was no free bleeding for some seconds; then followed a free gush of blood as the thrombus was washed out. The temperature was normal for the next three days, yet the blood cultures showed an increase in the colonies of from 5 to 60 per cubic centimeter. Then there was a chill; the temperature rose to 103.8 degrees. The right internal jugular vein was excised from the clavicle to the bulb, including a chain of enlarged glands. Above the facial vein the jugular was white, flat and densely adherent, and streptococci were present in its walls. Three days later a blood culture was sterile, and the patient went on to an uneventful recovery.*

The value of a positive blood culture in such cases is self-evident, and on account of the number of atypical cases in which the clinical signs do not allow early definite diagnosis, its value cannot be overestimated. Another factor of value is its aid in determining whether the jugular vein shall be ligated or not, after the mastoid has been opened, for in the presence of a positive blood culture we have a much more accurate and definite working basis than in the clinical symptoms alone, which are so often atypical and misleading. As an example of this, accept for consideration a case in which the mastoid operation has been performed and evidences of sinus thrombosis develop, or which may be present at the time of the primary operation, and the sinus is opened. The blood cultures are found to be positive and remain so, even in the absence of signs of jugular involvement. The logical deduction under such circumstances would naturally be that a general systemic invasion is still going on. That this takes place via the jugular vein is reasonable to conclude, in view of the constant conversion of positive into negative cultures after a jugular ligation. A case illustrative of this is that of a young man who, three weeks after a mastoid and sinus operation, had practically a normal temperature and no neck symptoms, yet complained of constant frontal and temporal headache. Blood culture showed 230 colonies of streptococci to each cubic centimeter. The jugular was ligated and found thrombosed, one portion of the thrombus being well organized, while the other had broken down. The patient made a good recovery. Here the definite diagnosis was established only by the blood culture.

The work of Libman and Celler is most valuable and instructive, as they found as a result of 163 blood cultures in 100 cases, that positive results were obtained only when the aural condition was complicated either by a meningitis or sinus thrombosis. In the former the pneumococcus and streptococcus mucosus were found in the blood. In an earlier series of 14 cases of thrombosis, cultures were positive in 9, being equal to 64 per cent; while in 16 later cases, they were positive in 14, or 87½ per cent, making a total of 30 cases with 23 positive cultures, or 77 per cent. In about 100 cases of suppurative otitis media or mastoid disease without sinus thrombosis or meningitis, the blood culture was sterile in every instance. As stated by Libman and Celler, the early authorities considered the pneumococcus as the most common organism in acute suppurative otitis media, but more recent investigators find it to be the streptococcus, and in their study of 360 cases, streptococcus pyogenes was found most frequently, the streptococcus mucosus next, and the pneumococcus in the smallest number, while it is a significant fact that no case of sinus thrombosis in this series of fifty cases was due to the pneumococcus.

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*This case was among my first in the series and I was disinclined to operate until clinical signs were present, so I disregarded the laboratory findings.

Regarding the presence of bacteria in the blood, they were not found in simple otitis media, mastoid disease, extradural abscess, or in brain abscess, and positive cultures were obtained only in cases of meningitis or sinus thrombosis. It will be found that the earlier the cultures are taken, the more frequently will positive results be obtained, but it is possible to obtain negative results even though the clot has disintegrated and passed through the jugular vein to form metastatic foci in various portions of the body. Cases in which the streptococcus was found in the blood after the mastoid had been properly operated upon and in which clinical symptoms still persisted, always presented thrombosis of the sigmoid sinus. In those cases where prior to the mastoid operation the local evidences are insufficient to account for the temperature and general disturbances, a positive culture would indicate that there is a more serious lesion than would otherwise be suspected, while in another class of cases where the sinus has been exposed and the clot removed, the persistence of streptococci in the blood has been the only indication to ligate the jugular vein, and in such cases it will be found that the streptococci disappear from the blood very rapidly following this procedure. In one instance the bacteria disappeared from the blood within four hours after the jugular vein had been ligated.

The report of Gruening very clearly enunciates the great value of blood cultures. In ten cases of lateral sinus thrombosis the blood taken from the median arm vein before ligation of the internal jugular, was positive in 7 and negative in 3. In all, the same organism that was present in the blood was also in the discharge from the ear; 5 being streptococcus pyogenes, 1 streptococcus mucosus and 1 bacillus proteus. The internal jugular vein was ligated in all these cases. While the diagnosis of sinus thrombosis was made from the clinical symptoms alone and the blood culture was not necessary excepting for corroboration, it was important as showing the relation which sinus thrombosis bears to systemic infection, and this relation once established will assist in a proper appreciation of obscure cases in which clinical data are insufficient for the recognition of thrombosis of the sinus. That a positive culture can be advantageously used as important evidence of the presence of a thrombus, has been repeatedly demonstrated and patients who, after a thorough mastoid operation, do not do well and whose temperature remains high though accessible parts of the sinus appear healthy, improve immediately on ligation of the jugular vein deemed advisable as the result of continued positive blood cultures. In two cases admitted to the medical ward of Mt. Sinai Hospital with high fever, systemic infection and no recent previous history of ear disease, the diagnosis of sinus thrombosis was made by exclusion of other foci, in the presence of a positive blood culture, and in both cases the lateral sinus was found thrombosed, though with the exception of an old perforation of the drum, there was no evidence of an active ear disease. Both cases recovered after the evacuation of a thrombus from the lateral sinus; one with and one without ligation of the jugular vein. The clinical data prove that streptococci in the blood do not necessarily lead to a fatal issue, but where the internal jugular vein is ligated, a more favorable prognosis is permissible.

As a result of the experience of the various authors quoted here, and that of my own, it is apparent that a large field of usefulness exists for the study of blood cultures in these obscure cases and undoubtedly the presence of a bacteremia in a patient with otitic disease under the conditions mentioned above means that sinus thrombosis is also present. Duel and Wright, however, in a study of 55 cases of otitic disease and two of frontal sinus suppuration, claim to have found a positive bacteremia in 16, 4 of which had definite clinical signs of sinus thrombosis, one acute diffuse leptomeningitis, one acute suppurative otitis media without mastoid involvement and 9 cases of mastoiditis without complications. They found streptococcemia present in all cases with clinical symptoms of sinus thrombosis and in the case of diffuse leptomeningitis, but in the 9 patients without any alarming symptoms, 7 had streptococci and 2 pneumococci in the blood, and as a result they arrived at the conclusion that when the clinical symptoms are pathognomonic of sinus thrombosis, a bacteremia is only a valuable additional confirmatory sign in connection with such symptoms. Their technic consists in inoculating broth with ten c. c. of blood and incubating it for two or three days and then centrifugalizing it. They claim to have demonstrated that in about 30 per cent of cases with trifling symptoms of otitis, there are one or more colonies of streptococci in each ten c. c. of the patient's blood, so that the proportion of cases actually having a bacteremia must be much higher than the figures would indicate. They also claim that in four other patients, they obtained positive cultures in simple mastoiditis with no clinical evidence of sinus involvement and uneventful recovery took place in all, so that they state they have proven that a bacteremia does exits in such uncomplicated cases. Dr. Duel also stated, however, that the early recognition of streptococcemia by means of blood cultures would undoubtedly lead to earlier operation and cause more gratifying results in many doubtful cases of septic sinus thrombosis.

The work of these otologists just quoted, differs from that of others and does not agree in any way with our experience, which consists at present of blood cultural investigations in about 130 uncomplicated mastoid cases with a negative blood culture in every instance, and 50 sinus thrombosis cases with 42 positive cultures.

The unique bacterial findings in the blood so frequently, as Duel and Wright indicate, is unexplainable, unless it be on the basis of differences in the cultural methods used. Surely it is unsubstantiated by any other reports in the literature and in no way vitiates our findings as is here clearly indicated. The method employed at Mt. Sinai Hospital laboratory by

Libman and Celler consists in dividing equally about 15 c. c. of blood among bouillon flasks and agar tubes, pouring the latter into plates immediately. Both bouillon and agar were used with and without glucose. In some instances serum was added to the various media. Subcultures were made from the flasks daily. The principal points of difference between the two methods consist in the concentration of the blood and the centrifuging. Libman and Celler, as a result of further studies on this subject, state that it is worthy of note that in not a single instance was the pneumococcus isolated either from the blood or from the sinus clot where this could be investigated. It is generally found that the original middle ear infection within a very short time becomes admixed with other organisms. But the pus in the mastoid or sinus remains dependent on a single organism and a pure culture is obtained from this source. A definite uniformity exists, however, in the predominating organism found in the middle ear discharge and that found at operation in the mastoid, and this fact, to my mind, emphasizes the great importance of taking cultures from the middle ear. "The organisms obtained from the blood in cases of thrombosis of the sinus, invariably corresponded to that isolated from the mastoid with one exception, and from the studies thus made, they conclude that nearly all cases of sinus thrombosis are accompanied by a bacteremia at some time or other and that cases in which streptococci are found in the blood after the mastoid has been properly operated upon and in which clinical symptoms persist and no other cause can be found for the streptococcemia are cases of sinus thrombosis."

Comparing these results with those of Duel and Wright previously mentioned in which they state that the bacteremia bore no relation to the sinus disease, they are therefore quite at variance with the result of the authors mentioned. Duel and Wright found streptococci 14 times and pneumococci twice. The relative high percentage of the latter is of particular interest. In endeavoring to confirm the method employed by Duel and Wright, Libman and Celler utilized it in 42 cases. They state they employed this method in 27 cases (22 mastoiditis and 5 otitis) and their own method in 82 mastoid cases and 16 otitis cases, 98 in all, and there was not a single positive culture. "To determine the possibility of a bacteremia without clinical signs in local infections other than those of the ear, a study of 66 cases was made both by the Wright method and controlled by their own method.* This included empyema of the chest, abscesses of various parts of the body, erysipelas of the hand, pyonephrosis, perinephritic abscesses, septic infarcts of the kidney, appendicitis, furunculosis, multiple streptococci abscesses, carbuncle of the neck, paronychia, suppurative adenitis, phlegmon of the hand and neck, etc., and the results were uniformly negative in every instance.

Our results agree in all respects with those of Leutert, in which he states that every case of bacteremia of otitic origin with the exception of meningitis, is accompanied by sinus thrombosis, and no bacteremia ever occurs in uncomplicated cases of mastoiditis."

These investigators also state, "As the result of later studies, that they find no justification for altering the opinions already expressed concerning the relationship between bacteremia and diseases of the ear."

The appearance of the bacteria in the blood stream from a sinus thrombosis, is the result of their separation from the primary focus, and their multiplication in the blood, or their presence later may be the result of a septic endocarditis, in which case the latter must be differentiated by the clinical symptoms, before the aural condition can be proven the cause of the bacteremia. However, in case the bacteria have been deposited in various portions of the body, it does not necessarily follow that all foci show bacterial activity at the same time, as some areas may become quiescent, while others become active in sending out organisms through the general circulation, although the bacteremia may in rare instances be continued from its original source in an indirect manner, as even after the jugular vein has been ligated, the bacteria may enter the general circulation by way of the petrosal sinus, or as the result of a concomitant meningitis, but in the latter instance the meningitis is readily recognized both clinically and by means of a lumbar puncture. At some time or other during the course of an infective lateral sinus thrombosis, a bacteremia always occurs even in acute cases where there is a parietal clot, that is before a complete thrombosis of the vessel has had time to form, and a blood culture will generally show a positive result, from the microorganisms present in the particular case being washed off in the blood stream from the inner areas of the partial thrombus. In some cases, however, no bacteremia will be present very early; but within a short time thereafter repeated blood cultures will show a gradually increasing number of colonies. Experience has also shown that they may decrease in number and entirely vanish, even before any operative procedures have been employed. In long standing cases where the patient is doing well and yet presents clinically a certain degree of sepsis, there may be no bacteria found in the blood, as the thrombus may have been disintegrated and particles carried to the lungs and lodged there. The bacteria are then confined in these emboli and remain localized in the pulmonary areas, either to become innocuous there, or more frequently to form septic infarcts. The explanation for this negative culture is in the antibactericidal action of the blood and the walling off of the lower end of the thrombosis by sterile clot.

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*An unpublished report made at a Mt. Sinai Hospital Clinical Conference Meeting.

A bacteremia of the streptococcus type associated with the usual symptom complex of chills and a septic rise and fall in the temperature, may also be found, where there is a thrombus of other venous channels of the body and especially so in the pelvic veins of the genito-urinary tract, or of other cerebral sinuses, or of the veins of the extremities, as well as in sigmoid sinus diseases. When the symptoms arise from a thrombus of the extremities, there is marked local evidence of the disease, so that the cause of the streptococcemia is plainly evident, while when the other intracranial sinuses are the seat of a phlebitis, local symptoms are in evidence, and the study of the case aids in elucidating the condition.

The presence of a bacteremia is most suggestive in the absence of such other possible causes as have been enumerated; and when there is a history of the presence of suppurative aural disease or where the symptomatology is obscure and an acute or chronic suppurative otitis is present, even though an endocarditis may also be present, it is advisable by all means to explore the sinus. The detection of a bacteremia should be possible in practically every case of sinus thrombosis and as further studies are made, the sources of error will undoubtedly become less and less. Negative findings may be obtained, however, and they may be the result of various causes, such as a sterile thrombus situated below the infected clot, which for a time at least might prevent a bacteremia from becoming evident, or the cultures may be taken before the bacteria are thrown off into the circulation. In the latter instance if a culture were taken a few hours later, the organisms would be found. It is also possible that the powers of hemic resistance being greatly increased, all the circulating bacteria might disappear within a comparatively short time by a highly developing bactericidal power of the circulating fluid, or it is possible that there may be such a small number of organisms in the blood that, in the minute quantity examined, they may not be found. The number of colonies in each cubic centimeter has varied widely, in our experience being from one to 320; or again the culture may be taken too late in the course of the disease, after all the organisms have disappeared from the circulation; this is always the case within a comparatively short time after the jugular vein has been ligated, so that the original focus of infection is thus cut off and isolated as it were; our experience showing that not infrequently the blood becomes sterile a long time before the clinical symptoms disappear.

Illustrative of this point is the case of a young woman recently operated upon. A large and firm thrombus was removed from the bulbar region. Owing to the critical condition of the patient on the operating table no attempt was made to ligate the jugular vein. Thirty-six hours later the clinical symptoms were so severe that it was determined to proceed. However, the culture taken between the first and second operations and reported only after I had already ligated the jugular was negative.

It must also be remembered that there may be an entire absence of a bacteremia, yet the patient will show metastatic deposits in various portions of the body, as the result of a previous sinus thrombosis accompanied with streptococci in the circulation, which has been operated upon and entirely removed as a focus for infection. . Such cases are the result of the early breaking down of a part of the septic thrombus, with a distribution of the microorganisms. This has ceased at an early stage and the local focus no longer acts as a factor in the septic dissemination and then for a time the blood is sterile, while at a still later period the various metastatic deposits commence bacterial activity and local abscesses result; so that one can readily see that at some time during the course of the primary sinus thrombosis, the presence of organisms in the blood is an essential fact, as their distribution is necessary in this way for emboli to be carried to various parts of the body.

Following a mastoid operation where a sinus thrombosis is suspected, but where the symptoms are not sufficiently definite to warrant opening the sinus and a blood culture has given negative results, it is most esssential that a second culture be taken, usually within a day after this time, and if it is then found positive, the indication is clear. In case the condition still continues suspicious and yet the blood remains sterile, repeated cultures should be made and they will be found of great value in finally clearing up an obscure case that otherwise might not be relieved by operation until a much later period. The rule can be laid down that in the presence of streptococci in the blood, there is a septic focus, and it is a definite indication that further operative measures are necessary.

Such findings should lead one to examine the ears, even though there are no symptoms calling attention to these organs. Several such instances have occurred in our experience, patients having been admitted to the medical wards as typhoid suspects. Given a patient presenting a rise in temperature accompanied with chills and a blood examination shows the presence of streptococci, it is good surgery to explore the mastoid process and lateral sinus, provided that another cause for the condition cannot be found and that there is established the absence of a primary infective focus elsewhere.

Whiting, in discussing one of the papers previously quoted, asks the question, given a suppurative otitis media, and a blood culture showing the presence of streptococci, is one justified in making the diagnosis of a purulent lateral sinus thrombosis? If one can eliminate endocarditis, erysipelas, streptococcus pharyngitis and other septic foci, and if the above conditions prevail, one is justified in seeking for a thrombus in the sinus, for one may be reasonably certain that the bacteria in the blood are getting there from the infected ear. Whether under such circumstances one should tie the jugular vein in every instance, we have not sufficient data at present to say, but certainly the presence of streptococci in the blood in connection with a suppurative otitis media, leads to the conclusion that it is a wise procedure.

Of the fifty cases of sinus thrombosis here referred to, in forty-one the internal juglar vein was ligated and exsected. In those cases where this was not done at the primary operation, over ninety per cent subsequently required this procedure.

The persistence of streptococci in the blood after the sinus has been operated upon and the thrombus removed, indicates that the internal jugular vein is the seat of a phlebitis and that the infected thrombus there is acting as a disseminator of microorganisms, and even should local or general symptoms of such a condition be absent, or should they be so slight that they alone would not warrant operative interference, yet my experience teaches that the blood findings are sufficient indication for further operation. The number of organisms found in the blood, however, in the presence of a lateral sinus thrombosis, whether accompanied with jugular involvement or not, bears no relation to the extent or severity of the blood infection, as an extremely severe case may show a minimum number of organisms to the cubic centimeter, while a comparatively mild case, relatively speaking, as all these cases must necessarily be considered grave, may show a great number of colonies obtained from the blood culture. A rapid decrease in the number of bacteria in the blood after operation as a rule can be construed as a favorable prognostic sign.

From the number of cases which I have studied with reference to the phenomena of bacteremia in relation to otitic suppuration, it can be definitely stated, in conclusion, that the finding of a bacteremia in the presence of a suppurative disease of the middle ear and its adjoining osseous spaces is proof evident that there is an infective thrombosis of the sigmoid sinus, and such a finding is warrant for immediate operation, while following sinus operation, the persistence of streptococci in the blood indicates that the internal jugular vein is involved, and measures for its operative relief should be at once carried out.

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XV.

CASES OF AURAL SUPPURATION PRESENTING IRREGULAR SYMPTOMS

By Edward Bradford Dench, M. D.,

New York.

As it is the unusual in medicine, as in every other science, which interests. I beg to report very briefly three cases of aural suppuration which furnished rather unusual clinical pictures:

Case 1. A boy about twelve years of age was admitted to my service at the New York Eye and Ear Infirmary, suffering from a chronic suppuration of the left middle ear. A radical operation was performed by one of my assistants and a primary graft applied. About four days after the operation the patient had a slight elevation in temperature and slight nystagmus toward the healthy side. The patient seemed to feel perfectly well and, aside from the temperature elevation and the slight nystagmus, presented no other unusual symptoms. The primary graft was removed and the wound packed. A slight infection of the superficial wound was present, and it was thought that this might explain the temperature. The wound was therefore freely opened and a wet dressing applied. For three succeeding days after the onset of the untoward symptoms, the temperature would be normal or nearly normal in the morning and would rise to 102° or 103° in the afternoon, the daily exacerbations becoming higher. Rotation showed the labyrinth of the affected side was dead. Blood cultures were negative. The original infection was streptococcic. Owing to the excursions in temperature, I was convinced that, in spite of negative blood cultures, we had to deal with a thombosis in the lateral sinus, and consequently asked my assistant to explore the sinus. This was done and the sinus was found to contain fluid blood, there being a very profuse hemorrhage both from the lower and upper end of the sinus when this vessel was opened. The wound was packed in the ordinary manner and the patient returned to bed. The next day the temperature fell to normal in the morning, and the differential blood count, which had previously shown a high polymorphonuclear percentage, showed a diminished number of these cells. In the afternoon, however, the temperature again rose to 104°. The blood culture was still negative. Reasoning that a partial clot lying in the jugular bulb might give rise to these symptoms, although its size might be quite insufficient to cause any obstruction to the blood current, I removed the internal jugular on the day after the sinus was opened. The vein contained no clot, but seemed somewhat thickened at its upper portion. Unfortunately, the vein was not examined microscopically. The wound in the neck was closed by primary suture, a deep drain of folded rubber tissue being introduced throughout the entire length of the wound.

On the day after the jugular was removed the temperature rose to nearly 104° in the afternoon. After that the temperature remained down steadily, and the patient made an uninterrupted recovery. A blood culture taken immediately after the removal of the jugular, showed the presence of streptococci. This is in direct opposition to the teaching so frequently laid down—that the removal of the jugular causes a disappearance of the streptococcemia.

This patient never had a streptococcemia until after the jugular was removed, and yet the removal of the jugular caused a complete abatement of all the symptoms of sinus thrombosis, and the patient went on to complete recovery. The wound in the neck healed throughout by first intention.

So much has been written recently regarding the value of the differential blood count and of blood cultures, in these cases, that it seems worth while to report a case of this character, in order to show that we must, after all, depend more upon our clinical symptoms than upon the laboratory findings. True, had we allowed this case to progress, we would undoubtedly have found streptococcemia, and would have removed the jugular at a later day. The best interests of the patient, however, were conserved by performing an early operation, and thus shutting off the focus of general infection before any general systemic involvement had occurred.

CASE 2. The patient was admitted to St. Luke's Hospital with a history of grip followed by a feeling of general malaise. Four days before his admission he suffered from severe pain in the right ear, and examination at the time of his admission to the hospital showed an acute inflammation of the right tympanic cavity. The right drum membrane was incised and considerable pus evacuated. The temperature, which was about 104° on admission to the hospital, fell considerably after incision of the drum membrane, but rose again to 104° the day after. The patient's temperature and general appearance suggested a beginning typhoid fever. The Widal reaction was indefinite on the first day. When I saw the patient, the right tympanic cavity was draining freely, there was very slight tenderness over the right mastoid, and the patient complained of moderate spontaneous pain in and about the ear. The polymorphonuclear count was somewhat elevated.

I advised observation for forty-eight hours, and if, at the end of this time, typhoid could not be diagnosed absolutely, that the mastoid should be opened and the sinus explored. I did not hear from the patient again until seventy-two hours after the time of my first visit, at which time the report was made that the Widal was less distinctive than before, and that the temperature had shown the marked fluctuations which had characterized the first two days' clinical history of the illness after admission to the hospital. I advised, therefore, the opening of the mastoid, exploration of the lateral sinus and excision of the internal jugular, provided no occlusive clot was found in the sinus. At the operation a few drops of pus were found in the mastoid cells. The sinus contained fluid blood and bled freely when opened. The jugular was excised in the usual manner. Three days afterwards the patient's temperature became normal, and he went on to a rapid recovery. In this case, the general history seemed to point to typhoid, and the patient's appearance certainly suggested a beginning, "continued" fever. The aural history was remarkably short for a case to develop symptoms of general sepsis, and for the first few days I was in doubt regarding the diagnosis. The absence of definite symptoms of typhoid, however, the presence of aural suppuration and the fluctuations in temperature determined the plan of procedure. The blood culture in this case was negative.

In these two cases, the point of interest is the success of removing the internal jugular, in spite of the fact that the sinus seemed practically normal on inspection and palpation. Where a clot in the lateral sinus is of sufficient size to occlude the lumen of this vessel, I believe that opening the sinus and removing the clot may cause a cessation of all symptoms, and that this procedure, in cases of this character, may be carried out with hope of success in a certain proportion of cases without interference with the internal jugular vein. If, however, septic symptoms are present while the sinus seems normal, we can only suppose that these symptoms are caused by a small parietal clot, and occlusion of the sinus will not prevent general absorption. The only relief to be obtained, in these cases, is the removal of the internal jugular, thus shutting off the localized focus of infection from the general circulation.

It is probable that in both of the cases above narrated, the clot lay in the jugular bulb and was parietal.

Case 3. A third case of interest was that of a patient upon whom I did a submucous operation about four weeks before the onset of his aural symptoms. The patient was in good general condition. The septal operation was exceedingly difficult, owing to the presence of adhesions between the displaced septum and the inferior turbinate of the occluded side. These adhesions made it necessary for me to tear the mucous membrane on the occluded side, in correcting the nasal obstruction. The patient did very well for about three weeks, when he contracted a severe cold in the head. One week after his cold he had an acute otitis upon the left side. This was mild in character, and the fluid evacuated, upon free incision of the drum membrane, which was performed eighteen hours after the inception of the acute otitis, was only a serous fluid, which showed no definite microorganisms, a few unclassified diplococci being present. The patient's temperature on admission was about 100°. It rose to 101° after incision of the drum membrane, but fell to about 99° on the following day. The discharge from the ear was very slight. On the day after the operation the temperature rose to 102° in the evening, and on the second succeeding day, at the same hour in the evening, rose to 101°. The patient lived in a town where true intermittent fever is common and gave a history of well-marked attacks of intermittent fever. For this reason, he was placed upon twenty grains of quinin daily. The diurnal excursions in temperature immediately became less, and the temperature did not go above 99° or 99½° in the evening, for a period of three or four days. The patient, however, had profuse sweats, and did not seem to be gaining strength. Owing to the mild character of the febrile movement, no blood examination was made, as I did not feel that the plasmodium would be in evidence. Ten days aftter the patient's admission, the temperature suddenly rose to 102°, fell to normal, and the next day rose to 102°. Examination of the blood on this second day showed no plasmodium present; the polymorphonuclear percentage was 78 per cent, and the white blood count was 5,200,000. The patient at this time had a slight bronchitis. I should have mentioned that the spleen was slightly enlarged at the first examination, and this sign was also present at the time of the last febrile attack. During this period, the middle ear suppuration had progressed favorably. The discharge had diminished in quantity, drainage was free, and there had never been more than the very slightest mastoid tenderness, and this was so ill-defined that it could scarcely be called "true mastoid tenderness." At the time of the acute attack there had been a hemorrhagic external otitis present, but this had gradually disappeared. In other words, the ear symptoms had progressed favorably for about ten days, and yet, at the end of this time, we had a rather pronounced febrile movement. The patient was examined by an internist, and several possibilities presented themselves. The temperature might be due to the slight bronchitis from which the patient was suffering, might be due to masked endocarditis, to sepsis from the ear, or a beginning typhoid. The relatively small leucocyte count seemed to be in favor of typhoid. Malarial infection was, naturally, ruled out, on account of the failure of the temperature to respond to large doses of quinin. On the second day of the febrile movement, the polymorphonuclear percentage fell to 68 per cent, and a blood culture taken twelve hours before was negative both for typhoid and streptococci. No medication, other than small dose of bromide, was employed. The patient's temperature fell to normal, and he made an uninterrupted recovery. What the exacerbations in temperature were due to, I do not know, but the case seems worthy of report, in conjunction with the other two cases mentioned above.

XVI.

A CASE OF SINUS THROMBOSIS, WITH EXTENSIVE ACCUMULATION OF FLUID PUS IN THE SINUS—RECOVERY AFTER RESECTION OF THE JUGULAR VEIN.*

By Robert L. Loughran, M. D.,

New York.

The patient presented as a case of sinus thrombosis, with extensive accumulation of fluid pus in the sinus, is six years of age. He was admitted to the Manhattan Hospital on July 1st with a history of an attack of measles beginning on May 11th, which had entirely cleared up in two weeks. During this time he had had a double acute purulent otitis media. The left ear had entirely cleared up in two weeks and the right had become normal after about three weeks. During the otitis he had had pain only at the onset, before the discharge appeared, both drums having ruptured spontaneously. During the first week the temperature had been as high as 103°. The boy was perfectly well for two weeks following the disappearance of the otitis.

Ten days before admission to the hospital he had been taken suddenly ill with a chill and a severe general headache, especially marked in the occipital region. For several days it was thought that he was developing a meningitis, the pain being of that type. The onset of the headache had been accompanied by an earache on the right side, which was referred to the mastoid bone rather than to the middle ear. Examination of the drum had not given any evidence of middle ear involvement. There was no prolapse of the posterior canal wall. There was no discharge. There was no evidence of pain on pressure over the mastoid bone until within two days previous to admission, and even then it seemed to be about equal on both sides. There was at this time pain on pressure over the location of attachment of the sternomastoid muscle and a distinct swelling at this point was noticed. The temperature had been apparently variable, some days going as high as 105°, with a remission to 100° or so, but these excursions had been irregular. During the ten days the boy seemed very ill and the severe headache had persisted.

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*Read before the Section on Otology, New York Academy of Medicine, October 14, 1910.

On admission he had a temperature of 104°, pulse 140. General condition good. He complained of some headache and a pain which he located over the tip of the mastoid, extending down along the sternomastoid muscle. An enlarged gland was discernible below the tip. Pressure elicited pain over the tip, but especially over an area of about one inch in diameter posterior to the antrum. There was no sagging of the posterior wall and the drum, while congested, was not bulging at all. It gave the appearance of an acute otitis in which exudation of serum had not taken place. The drum was incised freely under gas, and a very small amount of bloody serum evacuated.

The next morning his condition remained the same, both as to pain and the appearance of the posterior canal wall and drum membrane, there being but a slight discharge of blood-stained serum, which on bacteriologic examination, showed the presence of staphylococci. The temperature rose to 105° and the mastoid was opened. A small amount of seropurulent material was found filling a small antrum, as well as a few cells extending down toward the tip. The bone was markedly eburnated for the age of the patient. The sinus was found to be placed very far foward, leaving a space of only about a quarter of an inch between it and the posterior canal wall. The sinus was exposed for about a half inch in diameter, was congested, bright red in color, but smooth and apparently not thickened. The dura covering the middle fossa was quite low and was exposed for about a quarter of an inch in diameter, and was found to be hyperemic. There was, therefore, a very close association between a very small antrum, the dura and the sinus wall.

For the next five days the temperature ranged from 99° to 102°. The boy reacted well and his general condition was excellent. On the day following the operation a blood examination showed a leucocytosis of 22,444; red cells, 4,720,000;

polymorphonuclear percentage of 71. The wound was dressed on the third day and seemed satisfactory in every way, although there was no evidence of any beginning granulation over the region of the sinus. The sinus, however, looked perfectly healthy, as far as the color was concerned. On the fifth day the temperature rose to 104.4°. The wound was beginning to granulate in a satisfactory way, except over the sinus, which still looked in good condition. Next morning the temperature was 98.6°, and in the afternoon was 103°. The boy was feeling well and his general physical condition was satisfactory. A blood count on this day showed a leucocytosis of 13,777 and a polymorphonuclear percentage of 66. On dressing the wound next morning there was an appreciable change in the condition of the cavity. While the bony wall showed a satisfactory tendency toward beginning of repair, but not advancing rapidly, the sinus wall had ceased to have a healthy appearance. Its surface had become thickened and roughened and of a distinctly grayish color. There was, however, no change in the patient's general condition. He was sleeping well, was having no pain. He had had no chill or chilly sensation since the operation on the mastoid. It was decided to open the sinus.

On curetting the surface, a small necrotic spot was uncovered, through which fluid pus escaped on manipulation. It was apparently under pressure. The sinus was exposed from a point as far as possible down into the tip, upward toward the torcular, a distance of over two inches, before the wall began to lose its thickened appearance and its grayish color. This was incised for the full length of the exposure and the lumen found to be filled with a yellowish fluid pus for fully an inch and a half, which was walled off from the rest of the sinus by plugs of degenerating blood clot. Bacteriologic examination of this pus found it to contain the bacillus pyocyaneus and staphylococci. The torcular end of the sinus was curetted for a distance of about three-quarters of an inch, removing a mass of degenerating blood clot. This was followed by a free hemorrhage. Degenerating blood clot was likewise curetted from the bulbar end as far down as the curette could pass, but there was no hemorrhage following. The jugular vein was resected throughout its full length in the neck. It showed no macroscopic appearance of infection, but its contents showed on microscopic examination the presence of staphylococci. There was a large gland just below the tip of the mastoid, which was excised.

The boy did well following the operation, had no chill or chilly sensation, slept well, but did not take nourishment well. The mastoid wound began to granulate immediately. With the removal of the torcular end plug on the fourth day, there was no hemorrhage, and this region, along with the rest of the wound, looked perfectly healthy. The bulbar end ceased to have a purulent discharge at the end of a week, and when the patient was discharged from the hospital at the end of a month following the first operation, the wound had granulated almost to the surface and the boy was perfectly well.

The chief points of interest in the case are these:

The course of the infection from a latent infected process in the mastoid antrum, directly into the sinus without any lighting up of the subsided otitis media.

The slow development following the chill without other symptoms than the irregular excursions of temperature, and the severe headache, which probably could have been localized along the course of the sinus.

The failure of the sinus wall to be materially involved along with the infective thrombosis, until disintegration of the thrombous was well begun.

The slow development of a septic thrombus of staphylococcic origin, its disintegration in the central portion and its gradual advancement toward each end.

62 W. 52d Street.

XVII.

MECHANICAL AIDS TO HEARING.*

By Percy Fridenberg, M. D.,

New York.

While I have prepared no formal paper, I thought it would be interesting to have this subject brought up for discussion, for, after all, the important thing is the question of practical experience. It means much more than mere theory.

I shall not attempt to describe the various forms of mechanical aids to hearing, but shall speak about two types. The further back we go the more we find in the books about mechanical aids to hearing. Present-day books say very little about them. All of the recent advances have been surgical. The patient's health is the first consideration, after that the restoration of hearing. But, after all, the restoration of the function of the ear is a most important matter to the individual. If we consider the number of mechanical aids that are on the market and the number of people who are hard of hearing, it is very strange that we do not see more of them in use.

One reason for this is the vanity of deaf persons. The average deaf person is more self-conscious than the person who has lost his sight, and the deafness has to be very pronounced before he will make use of any mechanical aid.

They began to try to get mechanical aids that would not be visible, but these have practically all been given up. They were of most use in those cases where there had been a suppuration in the middle ear which had healed, leaving a defect in the drum. The attempt was made to restore the continuity of the membrane, but the great objection was that in introducing a foreign body into the ear it was liable to set up an inflammation that might not be cured. For that reason, that special form of artificial ear drum is best supplied by a little bit of cotton. Some men have had very good results by covering the opening with a little piece of paper, but no one form of mechanical aid has been of much value. They are all more or less useless and more or less dangerous.

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*Read before the Section on Otology, New York Academy of Medicine, October 14, 1910.

Sounds can be brought to the deaf in two ways. Either we could bring the person to the actual source of sound, as when we approach our lips to the ear, or by collecting the sound over a large area and preventing it from being lost in space. There are two types of sound-transmitting instruments—the tubes or sound receivers, and the resonators or trumpets. The ordinary speaking tube carries sound very distinctly. Ordinary conversation can be carried on for 1200 feet with absolute distinctness. We hear so much worse in air, for there is an exit of the vibrations in every direction, and only a small amount of the vibrations come to the ear. If we can keep a large part of the sound and bring it to the ear, there is a magnification. There are coiled conversation tubes for that, which are used from one person to another. Where it comes to hearing music or conversation in a large room, it must be replaced by something else.

Then we have sound receivers. The magnification of sound depends on concentration, conduction and resonance.

The sound receiving apparatus depends on the fact that the air wave sets in motion some medium denser than air, which does not lose itself. The sounding board of the piano, and the case of the violin depend on that principle. When the air waves set wires, wood or metal in vibration it is kept up for a long time, and thus this resonator is made. The oldest form of applying this aid is by putting the hand behind the ear. That puts the auricle in better position to collect the sound in the ear. Politzer says that in over half of his cases this method was as good as any hearing trumpet, and was only inadequate in extreme cases of deafness.

In recent times they have taken advantage of certain physical innovations. First of all the microphone. The ordinary microphone is simply a flat box with a very delicate film of flexible metal in it, so that the air waves set that little plate in vibration. That was held close to the ear, so that no air waves could escape into the atmosphere. When the telephone came out, the same principle was used, with the addition of a secondary battery. All the instruments that come out now consist of a small receiver, a small battery in the ear, and a microphone transmitter. Instead of its being suspended in any point, it simply rests on a number of small grains of carbon. If you will take up one of these you will hear a fine rattle inside. That is called the loose contact. The advantage of that is that you can get a very much more delicate reaction to different intensities of sound and consequent flexibility.

A slight sound will bring it into contact with one or two carbon grains without deflecting the plate as a whole or bending it in any way. One of the disadvantages of the electric microphone, the acousticon and others of this type is that the slightest motion of the receiver will make those little grains move around, and you have a constant noise in the ear, which is accentuated by the receiver, and many find that so objectionable that they have given up these electrical instruments altogether. The acousticon people tell me that if you put the instrument on the table and not wear the receiver, so that the grains are not thrown about, the secondary sounds in the ear will disappear, but this is a great annoyance. Also, they accentuate a great many varieties of sound at the same time, and people who have accustomed themselves to picking out the sounds which are of interest to them and so hear fairly well, find themselves troubled and confused. But there is no doubt that by using these instruments they get accustomed to them and hear very much better than before, and it is a question whether any improvement is due to the instrument.

The pathologic terms used in the various prospectuses are very pathetic. All of these electrical appliance people have a vibrator which they sell with the mechanical aid to the hearing. It simply produces a loud rattling noise.. It is certainly a very coarse method of producing any massage effect, and I have never heard of any good results that could not be better obtained by the physician himself.

I have made a few tests on patients. I have had only one or two cases of bona fide nerve deafness where I could make out absolutely the involvement of the nerve, and in those cases I could not get any benefit from any of the commercial aids. The old chronic middle ear catarrh seemed to do best.

I have brought here tonight one or two of the standard aids, which I will show. I forgot to mention in passing that one of the oldest forms is the socalled dentophone or audiphone, which was supposed to take the place of air conduction entirely. That type was held between the teeth, and the air waves were supposed to be carried by the fan (phone) to the internal ear. I have found one or two references in literature to it, but no one seems to think much of it. Toynbee tells of a man who used to let his fingernails grow very long and would hold them against the wall. He was very fond of music, and in this way could hear tone vibrations fairly well.

I have here the ordinary conversation tube. This is the oldest form of all. You will find it mentioned in all of the text books. That is a combination of the transmission and receiving system. You have this bell-shaped receiver and so get a larger volume of sound. This is an improvement on that made by Meyrowitz, with a microphone disc at the receiving end, who calls it the audiphone tube. One of the advantages of this is that you have no irritation of the external canal, and my patients tell me they suffer very much from anything that they have to keep in the ear. How much bone conduction there is in these cases I cannot tell, but there is some. Another improvement on this tube is simply the cutting out of the bell on two sides so that the speaker can bring it close to his mouth. That is a decided disadvantage. You get the best results in all the speaking tubes when you speak across them. When you speak directly into the tube the column of air is a solid body and, in motion, is pressed directly against the patient's drum. If you speak across the tube, all the patient gets is the vibration of the air. These tubes have the effect of bringing the mouth to the patient's ear—they can hear as far as the tube extends. There seems to be less actual vibration in the patient's ear with the microphone tube than with any conversation tube I have tried.

Then they went a step further on the same principle and Meyrowitz got out one that seems as if it would be just the right thing. He has combined the telephone receiver and transmitter in one instrument. As a matter of fact, it is not as good as the speaking tube. It is much smaller than the average speaking trumpet. There is not sufficient surface to act as a resonator at all. The microphone disc is all right, but if you compare these you wlil find that it is very defective. If we had some large resonator instead of the hard rubber, I think the results would be better. If you are going to have as big a thing as that it would be just as well to have one that will make them hear.

This form has various names. It is generally known as Miss Green's phone. It is an excellent one. This resonator must not be too large. One of the important points is that the air wave should be reflected in such a way that the maximum of sound waves shall be sent into the tube. In this there is no reflection at all; the sound waves come right out again. This thing has, as you see, a very large surface, which acts as a resonator and vibrator with which the tones and all sounds that strike the hollow bell are reflected against the outer surface—which is cut open—and sent down the tube. It does the work, and if a thing of that sort were connected with a microphone it would be an exceedingly good instrument.

This is known as the telescope horn. It is very beautiful when closed, but rather formidable when open. Its action is that of a conversation tube, for while there is some resonance people have to hold it pretty close to get much result. It is rather a conversation tube than trumpet.

I spoke of those instruments which are introduced into the external meatus. This is known by a very beautiful title—the apparitor auris. What that means, I don't know. It has a small silver tube to extend into the depth of the ear. It is not pleasant to wear.

Here is an ear trumpet made in London (London Dome), in two or three sizes, and for its size this is an extremely efficient mechanical aid to hearing. It is very small, and can be held in the palm of the hand; it can be held up to the ear, and does not attract much attention. The only objection to it is the tip, which has to be put into the ear. If you will examine the interor of this instrument you will find that this tube is prolonged inside. You will find invariably that waves reflected from the periphery are sent into the opening of the tube. It is prolonged at this angle, and no matter what the ramifications of the tube on the outside, if you cut them open, you will find it is like that. The same principle is used in the improved trumpets.

I want to show you now the two principal electrical instruments on the market—the acousticon and the Mears aurophone. This is the ear phone made by Mears, and it has the advantage of great portability. It has a headpiece which can be put over the head and held there; this is the telephone receiver, and here is the microphone receiver for the ear—and you can hear the little grains of carbon rolling around to make the contact. If you will examine this you will find that they have bands of metal to reduce the reverberation and cut down the size of the sound waves. The object of that is to cut down the amount of resonance. If a bell is struck on the rim, the whole bell will give one big tone; if you break up the volume of the air in some way by strips of metal, there will be very much less vibration of the walls—plenty of vibration of the air, but the vibration of the instrument will be reduced.

Here are two or three transmitting plates. This one is broken up into a number of small holes and there is very little vibration. In those that are wide open, the vibrations are comparatively large. That is the reason why when you listen to a sea shell you get the roaring noise—the whole shell vibrates. I think the microphone people have gone too far—the amount of air getting in is not sufficient—at least the tests I have made with this compared with the larger acousticon show that this is defective. At least that is my experience. The other one is built on the same principle. The idea of having a battery and sound receiver in one is a very good idea, but the advantage of this one lies in the sound receiver. It is quite large. This is for cases of what we call medium deafness, when the patient can hear a loud voice; they have others with four and five receivers, so that sound from any direction will produce the same effect. It is very possible that much sound will enter this, even if it is not directly in line. That is the advantage of this instrument, the reflection of sound waves inside—for you have a section through the top which holds the periphery; here there is a plate inside, and here are the carbon points of contact that rest against this metallic point which vibrates, and inside the receiver is like that; any sound that comes in is reflected up toward these little carbon contact points, where with the ordinary transmitter you have that, and only sounds that come directly to it are transmitted. No matter from what direction the sounds come in that they are reflected up to it.

I am sorry I have not had time to take a large series of cases and present figures, but it will be more interesting to have the experiences of some of the men who have had chronic cases.

XVIII.

PHYSIOLOGIC VESTIBULAR NYSTAGMUS.*

By J. R. Fletcher, M. D.,

Chicago.

Until very recently otologists in general have given but little attention to vestibular nystagmus. The observations of Purkinje, the researches of Flourens, Schmiedekam, Goltz, Baginsky, Högyes, Ewald, Mack, Breuer and Crum-Brown were known to but few, and interested the physiologist, neurologist and ophthalmologist chiefly.

In 1907, after three years of labor, Barany presented clinical vestibular nystagmus to the otologist.

Though it is true that the term nystagmus embraces not only rhythmic and undulating movements of the eyes, but also movements of the head or whole body, especially in lower animals, it is herein meant to refer to eye movements alone.

In order to avoid confusion, it is necessary to distinguish sharply between vestibular and ocular nystagmus.

Vestibular nystagmus is the nystagmus rhythmicus; ocular, the nystagmus undulans of Raehlmann.

CHARACTERISTICS.

Vestibular nystagmus is characterized by rhythmic movements of the eyes, of equal excursion, but of unequal velocity. It, therefore, has two components—quick in one direction and slow in the other. The nystagmus is increased if the eyes are directed toward the quick component, and decreased, or ceases entirely, when the eyes are directed toward the slow component.

This means that both the length of excursions and the velocity of the movements are respectively either increased or diminished when the person examined looks in the extreme lateral direction, toward the quick or slow component, without turning the head.

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*Read before the Chicago Laryngological Society, February, 1910.

The nystagmus does not cease at once upon closing the eyes. It occurs in the planes of the canals, or is compound, that is, involving more than one plane; for instance, horizontal and rotary. Its plane depends upon the position of the head at the time of irritation.

Falling or other ataxic movements occur in the opposite direction to the quick component.

Not infrequent accompanying phenomena are vertigo, nausea and vomiting, especially when the nystagmus is rotary.

The direction of vestibular nystagmus is designated by the quick component.

Ocular nystagmus is characterized by undulating movements of the eyes, of equal excursion and velocity, and cannot, therefore, be said to have any special direction. It is not increased when the eyes are in either extreme lateral position. On the contrary, it ceases when fixation of vision in any direction is possible. It ceases when the eyes are closed. It can be produced in any plane.

Its plane changes with an alteration of the relative position of the head to the moving object (objects) which the eyes attempt to follow. For example, a cylinder upon which have been placed alternate black and white stripes, revolving around the vertical axis, will cause a horizontal ocular nystagmus when watched while the head is erect. If the cylinder is revolved around the horizontal axis, or if the cylinder is kept in the vertical position and the person watching its revolutions lies down, the plane of the nystagmus will change to the vertical (toward the forehead).

Physiologic ocular nystagmus is never compound or rotary.

Physiologic vestibular nystagmus can be produced:

(a) By turning the body, either in the upright or recumbent position, around the vertical axis (nystagmus by turning).

(b) By the application of heat or cold to the tympanic cavity (caloric nystagmus).

(c) By the galvanic current (galvanic nystagmus).

Spontaneous vestibular nystagmus sometimes occurs in perfectly healthy persons, but only when the eyes are in the extreme lateral position. Its excursions are very short, but increase if the position of the eyes is maintained. Its quick component is always directed toward the side to which the person looks. If the head is erect, the plane of the nystagmus will be horizontal, rotary, or both combined.

EXPERIMENTAL NYSTAGMUS.

Flourens found that by opening any of the semicircular canals, nystagmus occurred in the plane of the canal thus irritated. He, therefore, deduced the law that each canal produces nystagmus in its own plane. He came very near the whole truth when he stated that these canals exert a restraining or controlling influence upon the body movements.

Goltz confirmed the findings of Flourens and first declared the semicircular canals to be organs governing equilibrium.

The following has been taken from among the experiments of Ewald to demonstrate certain points:

He uncovered the right horizontal membranous canal of a pigeon, at the arch, and inserted a compression plug so that the endolymph could not flow by it. He then drilled another hole between the first and the ampulla. Over this opening he made fast a cylinder and piston, to which was attached a hand bulb of rubber. When the bulb was pressed the piston was thrust against the membranous canal, causing the endolymph to flow in the direction from the ampulla to the utriculus. This resulted in a slow movement of the eyes to the left. When the piston was aspirated the endolymph flowed from the utriculus to the ampulla, causing a slow movement of the eyes to the right or toward the side experimented upon. This experiment showed:

1. That movement of the endolymph is the primary act.
2. That the slow component comes from the vestibular apparatus.
3. Its direction is governed by the direction of the flow of endolymph.

Upon these facts, the form of the ampulla and end organ of the vestibular nerve in the ampulla, the crista ampullaris, and the connection of both vestibuli through their nerves with Deiter's nucleus and the eye muscle centers, together with the voluntary eye movement control from the brain cortex, is based the theory of vestibular nystagmus, which is as follows:

THEORY.

The endolymph contained in the membranous canal and utriculus flows through the ampulla, over the crista ampullaris. It moves the cupula which caps the epithelial hairs of the cells of the crista in the direction of its current. (Fig. 1.) This motion makes tension upon the hairs, causing a sensation which is transmitted by the vestibular nerve to Deiter's nucleus, thence through direct and crossed fibers to the oculomotor, abducens and trochlearis centers, through their nerves to the extrinsic eye muscles. This accounts for the slow component of the nystagmus, the reflex eye response to vestibular irritation. The quick component, bringing into action the opposite group of eye muscles, must arise elsewhere. Ewald maintained that the quick component is of extralabyrinthine origin, and that it is a movement of recovery. Barany thinks likewise, and believes it originates in the gyrus angularis, as fibers from there are known to communicate with the eye muscle centers through Monakow's (?) cells. Add to this the well-known synergetic action of the eyes, and we have facts enough to make the understanding of reflex eye movements from the stimulation of one vestibular apparatus quite easy. The canals work, however, in pairs, never singly, as will be seen in the consideration of nystagmus by turning. Their action in turning must be simply intensification of the normal physiologic. The action of both canals at the same time (Fig. 1) is a stumbling block in the way of easy understanding of the phenomena of nystagmus. To simplify it, I have evolved a

THEORY OF SYNCHRONISM.

In the evolution of this theory I have become convinced that the cristæ of both canals of a pair act together simultaneously, and never under normal physiologic conditions, in such manner as to antagonize each other. As there are but two directions in which the cupula can move in the ampulla, away from or toward the utriculus, it must follow that there is a position of greatest and one of least physiologic activity and a position of rest. (Figs. 1 and 3.) When the cupula has moved as far as it can in one or the other direction, it is in the position of greatest or least physiologic activity, and its fellow in the opposite canal takes the opposite position.

The direction of greatest or least physiologic activity means motion toward one or the other active positions. The cristæ of the pairs of canals are in close communication through Deiter's nucleus, and each is notified immediately of any action of its fellow. The crista which is stimulated by the movement of its cupula in the direction of greatest physiologic activity dominates and determines the direction of the slow or vestibular component of the nystagmus. The cupola of the opposite crista moves in the unantagonistic direction. It is stimulated in the direction of least physiologic activity, thus giving notice of harmony to the dominant crista and to the auxiliary senses which maintain the equilibrium. (Fig. 1.)

The dominant canal is not necessarily the one primarily stimulated, because if the stimulation is such as to cause the cupula to move in the direction of least physiologic activity, then its fellow of the other canal of the pair synchronously moves in the direction of greatest activity. Of course, the one moving in the most active direction dominates and determines the direction of the nystagmus. Figure 1 shows the cristæ of both horizontal canals in active positions. These positions are in accord with Ewald's experiments. My own opinion, based upon the phenomena of nystagmus by turning and of caloric nystagmus, leans toward the reversal of the directions of activity. Their positions are correct in nystagmus by turning, but the question is, which sends out the strongest impulse?

Ewald assumed that the canal primarily stimulated dominates, and overlooked the fact that both of a pair work synchronously. This, I think, is the common error. Just what physical mechanism causes the flow of endolymph to take place in the unstimulated canal (see caloric nystagmus), I am not in a position to say. There are several possibilities. This much may be said with reasonable certainty: When one crista of a pair is set into activity by any stimulus whatsoever, the tonus of the other, through their nervous mechanism, is so changed that it becomes active also.

Physiologic nystagmus, with its associated symptoms, is an expression of overstimulation of the vestibular apparatus.

PLANES OF ACTIVITY.

Flourens found that the horizontal is the typical functionating plane. Therefore, when the head is erect, the horizontal pair of canals functionate. When the head is inclined ninety degrees forward or backward, the anterior vertical pair functionate. When the head is inclined ninety degrees toward the shoulder, the posterior vertical pair functionate. In intermediate positions of the head, two pairs of canals may functionate at the same time, producing the following effect reduced to a law:

When two pairs of canals functionate at the same time beyond their normal physiologic activity, the reflex result of their combined action is compound nystagmus. That is, nystagmus in the planes of both pairs of canals.

NYSTAGMUS BY TURNING.

(Horizontal Nystagmus.)

If a perfectly healthy person seated in a revolving chair (preferably without a screw) is turned a few times, vestibular nystagmus will occur.

The nystagmus will be in the direction of turning during turning (primary nystagmus). (Fig. 1.) Upon sudden cessation of turning, the nystagmus changes to the opposite side, or in the opposite direction to the turning (after nystagmus). (Fig. 3.) In a few cases, after thirty to forty seconds, it changes again, for a very brief time, in the direction of turning (so-called after-after nystagmus, better called ultimate nystagmus).

With the head erect during turning, the horizontal pair of canals will be in the horizontal or functionating plane. Their ampullæ are at the ends of their lateral or outer arms, and open into the utriculi. They may be likened to two horseshoe-shaped tubes, placed side by side on a table, the open part of the horseshoe pointing away from the observer. (Fig. 1.) The outer or lateral end of each tube is much enlarged, the ampulla: both ends of each open into a sack, the utriculus. The tubes and sacks are filled with a fluid, the endolymph. If these tubes and sacks are revolved to the right, in the direction of motion of the hands of a watch held face upward, the large mouth of the right tube moves away from the endolymph in the sack, causing the flow of fluid to be from the enlargement to the sack, or from the ampulla to the utriculus, the direction of least physiologic activity. The large mouth of the left tube moves toward the endolymph in the sack, causing the flow to be from the sack to the enlargement, or from the utriculus to the ampulla, the direction of greatest physiologic activity for this pair of canals.

As the hairs of the crista ampullaris are bent in the direction of the current, like grass in a stream of water, it must follow that the slow component of the nystagmus is directed to the side from which the strongest sensation emanates, the side upon which the endolymph flows into the open mouth of the ampulla, or to the left during turning to the right.

The quick component of the nystagmus, governed by the cortex, is directed to the right, or in the direction of turning. As the direction of the nystagmus is designated by the quick or most easily seen component, this nystagmus is said to be in the direction of turning during turning. The dominant canal is the one in which the cupula has moved in the direction of greatest physiologic activity, irrespective of the source of irritation. Barany compares the movement of endolymph to one standing in a car. When the car first moves, one falls backward. In a few moments both car and passenger move together, at the same velocity. When the car suddenly stops, one plunges forward in the direction in which the car is moving. So it is with the endolymph. For example, in turning to the right, after a slight movement in the opposite direction to the turning, the endolymph is carried with the turning and at the same velocity. When the turning suddenly stops, the endolymph rushes on in the direction of turning, for a moment, into the mouth of the right ampulla, or from the utriculus to the ampulla, the direction of greatest physiologic activity, and from the left ampulla to the utriculus, the direction of least physiologic activity. The result is nystagmus to the right during turning. The left crista exerts the strongest influence, and the vestibular component is to the left. After turning, there is immediate reversal of direction of the nystagmus opposite the direction of turning. The right crista now dominates. The slow component is to the right, the quick to the left, constituting nystagmus to the left.

The duration of horizontal nystagmus is, on the average, forty-one seconds to the right and thirty-nine to the left, after ten turnings.

ROTARY NYSTAGMUS.

We must now consider the anterior vertical pair of canals. The facts which follow will further emphasize Flourens' law that each canal produces nystagmus in its own plane, that is, in the plane in which it normally rests when the head is erect. Let us consider the horseshoe-shaped tubes lifted so that the open ends point downward. (Fig. 1.) The ampullæ open into the utriculi from above downward, or in the vertical plane. (Fig. 2.) In this position turning has no influence upon them. With the head inclined ninety degrees forward the ampullæ of the anterior vertical canals open into the utriculi in the horizontal or functionating plane from before backward—just the reverse direction to the opening of the horizontal pair. In turning to the right while in this position the endolymph flows from the utriculus through the right ampulla, the direction of least physiologic activity; through the left ampulla to the utriculus, the direction of greatest physiologic activity, exactly the reverse of the horizontal canals. The slow component of the nystagmus is directed to the left. The plane of the nystagmus, with relation to the head, is not horizontal, but frontal, that is, rotary. It is directed to the right during turning, and to the left after turning. With the head inclined ninety degrees backward, the ampullæ of the anterior vertical canals open forward into the utriculi, in exactly the same direction as do the horizontal pair with the head erect. The direction of the nystagmus caused by turning to the right is, however, just the reverse to the horizontal, both during and after turning. It is in the normal plane of its canal, therefore rotary. This is further evidence of the direction in which the cupula must move to cause the greatest tension on the hair-like epithelial prolongations of the crista ampullaris and thus produce the governing sensation.

VERTICAL NYSTAGMUS.

The posterior vertical pair are almost in the sagittal plane. Their ampullæ enter the utriculus about midway between the horizontal and vertical planes. The nystagmus which results from turning when they are placed in the horizontal plane by inclining the head to the shoulder ninety degrees is vertical. It is directed toward the forehead, or in the direction of turning during turning, and toward the chin or in the opposite direction to the turning after turning.

CALORIC NYSTAGMUS.

Many otologists have noticed that when irrigating the ear with too warm or too cold water, their patients have vertigo, which is a symptom commonly associated with rotary nystagmus. Most notable among them are Schmiedekam, as far back as 1868, Baginsky (whose conclusions were incorrect) and Urbantschitch. Cohn observed vertigo and nystagmus in 1891, and although acquainted with all the theories of this vertigo, expressed the opinion that the phenomena emanated from the semicircular canals. He, however, failed further to follow up this interesting subject. To Barany alone belongs the honor of systematically investigating the influence of water of various temperatures upon the action of the vestibular apparatus; the discovery of many new and important facts, and the application of them to the diagnosis of labyrinthine and intracranial disease. He teaches the following:

When the ear is irrigated with water, warmer or colder than the body temperature, a definite nystagmus occurs. Water of the body temperature causes no reaction.

When one ear is irrigated with warm water, rotary nystagmus takes place toward the irrigated side. When cold water is used, the nystagmus is directed to the opposite side, that is, the quick component is away from the irrigated ear. Its character is compound (rotary and horizontal). These reactions are constant, no matter whether the ear drum is punctured or not. So long as the labyrinth is not completely destroyed, the reaction takes place, and is of special clinical significance for this reason. When both ears are sprayed with water of the same temperature, either warmer or colder than the body temperature, nystagmus occurs to both sides. By looking in the extreme left lateral direction, the quick component of the nystagmus will be directed to the left. By looking in the extreme right lateral direction the quick component will be toward the right. It is much stronger than the spontaneous physiologic nystagmus. There is no nystagmus upon fixation of vision straight ahead.

If the right ear is irrigated with cold water and the head placed at an angle of 180 degrees to the upright position, so that the vertex of the head is toward the floor, rotary nystagmus occurs to the right, or in the same direction as when warm water is used and the head kept in the upright position. The endolymph flows from the utriculus to the ampulla (the direction of least physiologic activity, allowing the left canal to govern the slow component and indirectly the direction of the nystagmus).

Barany's theory is as follows: "We may compare the labyrinth to a vessel filled with fluid of 98.6° F., the outer wall of which is syringed with cold water. The fluid next to the syringed wall is cooled and sinks to the deepest part of the vessel, and in its place flows water of the body temperature. Thereby a circulation in the vessel is set up. This motion is certainly very small, considering the dimensions of the canals. It is clear that syringing with hot water produces a current in the fluid exactly opposite to that produced by syringing with cold water."

If this theory is correct, my theory of synchronism is further substantiated, for the reason that by the use of cold water horizontal and rotary nystagmus take place to the side opposite the irrigated one, while heat produces the opposite reaction. If the cooler fluid sinks, it must flow from the ampulla to the utriculus, the direction of greatest physiologic activity, in the anterior vertical canal, as its summit is the highest point of the vestibular apparatus. It flows from the utriculus to the ampulla in the horizontal, because its arch is exposed in the antrum to thermic influences and is lower than the ampulla. (Fig. 2.) This flow is also in the direction of greatest physiologic activity for the horizontal canal. This nystagmus is equivalent to the after-nystagmus by turning to the right, with the head inclined 45 degrees forward during turning. If we consider the right side to have been irrigated, the quick component must be directed to the left and the slow to the physiologically most active side, the right. The nystagmus must be compound and it is so. The endolymph movement is reversed when hot water is used—that is, it rises to the highest point, which is the summit of the arch of the anterior vertical canal. This produces a rotary nystagmus to the irrigated side —that is, the quick component, of cortical origin, is so directed. The slow or vestibular movement is directed toward the unirrigated side, as its cupula has moved in the direction of greatest physiologic activity, and overbalances the action of the crista of the irrigated side.

When the head is inclined 90 degrees toward the right shoulder, after the right ear has been irrigated with cold water, horizontal nystagmus to the right is produced, as the indifferent end of the horizontal canal is the highest point and its ampulla rests against the lateral labyrinth wall. The endolymph flows from the ampulla to the utriculus, the direction of least physiologic activity. Incline the head to the left shoulder and the nystagmus will be directed to the left—as the right ampulla is then the high point, causing the endolymph flow to be from the utriculus through the ampulla, the direction of greatest physiologic activity. Warm water produces the opposite effect in these positions. The posterior vertical pair seem to be uninfluenced by the application of heat or cold to the lateral wall of the labyrinth. They are so deeply situated and the others so exposed that the nystagmus becomes severe enough to cause the experimenter to stop before the posterior vertical pair show any signs of disturbance.

COMPOUND NYSTAGMUS.

This form of nystagmus is the result of more than one pair of canals functionating more forcibly than normal physiologically at the same time. It occurs in turning with the head in an intermediate position between the erect and 90 degrees forward, etc. In such case the nystagmus is horizontal and rotary, or diagonal, viz., compound.

ATAXIA.

(Reactionary Movements.)

Barany has formulated the following law with relation to reactionary movements of the body during nystagmus: "The movements of the body take place in the plane of the nystagmus, and their direction is opposite to the quick movement of the nystagmus."

It is not constant in all persons.

Its relation to the severity of the nystagmus differs in different persons.

Sometimes falling takes place easily when the nystagmus is slight. In another case it may not occur at all when the nystagmus is very strong.

It does not occur in horizontal nystagmus.

"Frequently with open, as a rule, with closed, eyes, the sensation of falling occurs to the right in right rotary nystagmus. With the eyes closed and turned in the direction of the quick movement (to the right), the sensation of falling is increased; with the eyes turned in the direction of the slow movement, a lessening or cessation of same." (Barany.)

Although the sensation of falling is to the right, these persons actually fall to the left.

In right rotary nystagmus, when standing erect, with the feet together and eyes closed, the falling is in the frontal plane to the left. If the head is rotated to the left shoulder, the falling is forward. If rotated to the right shoulder, the falling is backward, as the quick component is toward the front. If the head is inclined 90 degrees toward the chest, no falling occurs, but rotation of the whole body takes place to the left. The nystagmus is rotary and actually in the horizontal plane. Falling in this plane is impossible.

Many persons experience the sensation of falling only when the senses which are auxiliary to the vestibular apparatus in the maintenance of equilibrium, namely, sight and the muscular sense, are at rest; that is, in the sitting or recumbent posture, with the eyes closed.

Ataxia can be considered of vestibular origin only when the falling is in the opposite direction to the quick component of the nystagmus, and when change of the position of the head causes a change in the direction of the reactionary body movements.

Other associated symptoms of vestibular nystagmus are:

1. *Movement of Neighboring Objects.*—In some persons this movement is continuously to the side of the quick component; in others to the side of the slow component. In another group the motion is from side to side. And, last, there are those who see no movement. In the first group an optical impression is made by the quick component only. In the second, by the slow component only. In the third, by both com-

ponents. In the fourth, by neither. In the first three groups the seeming movements are increased by looking to the side of the quick component and lessened by looking toward the slow component.

2. Frequently there is darkening of the field of vision, or colors or dark spots appear before the eyes.
3. Pallor or flushing.
4. Perspiring.
5. Palpitation, or slowing of the pulse.
6. Trembling.
7. Quickening and deepening of respirations.
8. Partial or complete loss of consciousness.

These accompanying symptoms, second to eighth inclusive, occur in persons of unstable nervous system, and chiefly during rotary or vertical nystagmus.

In consequence of their occurrence in neurasthenics, consideration of these symptoms does not strictly belong in a paper upon physiologic nystagmus, but are inserted to cause close observation and to prevent error. (From my notes of Barany's lectures.)

GALVANIC NYSTAGMUS.

When the cathode or negative pole of a galvanic current is applied just before or behind one ear and the anode or positive pole is placed upon some remote spot of the same side, twenty to twenty-five milliamperes, will produce a nystagmus to the side thus irrigated. That is, if the cathode is placed on the right ear, the quick component of the nystagmus is to the right. The slow or vestibular component is directed to the left. When the anode is placed on the right ear, the nystagmus is directed to the left. It will be seen that the cathelectrotonus produces rotary nystagmus equivalent to the primary by turning and to the caloric by heat.

Anelectrotonus equals rotary after-nystagmus by turning and the caloric which cold produces.

"Galvanic nystagmus is most plainly seen when the eyes are in the extreme lateral position. Earlier authors have neglected this and have fallen into error when they have thought vertigo and disturbance of equilibrium to be the first phenomena which appear. When the lateral position of the eyes is chosen, we always observe nystagmus to be the first phenomenon." (Barany.)

The accompanying symptoms of rotary nystagmus from galvanism are the same as in rotary nystagmus from other causes.

SUMMARY.

Nystagmus may be divided into two chief types: *Vestibular* and *ocular*. The main distinguishing characteristics are:

Vestibular.	*Ocular.*
Rhythmic eye movements, of equal excursion, but unequal velocity.	Undulating eye movements, of equal excursion and velocity.
Has, therefore, two components, quick in one direction, slow in the other.	No quick component.
Nystagmus increased when gaze is in the direction of quick component. Decreased or stopped when gaze is to the side of slow component.	Not increased, but ceases with fixation of vision in any direction.
Does not cease upon closing eyes.	Ceases when eyes are closed.
Each pair of canals produce nystagmus in their own plane.	Plane governed by relative position of head to objects looked at.
It is either horizontal, rotary, vertical, or compound.	Never compound or rotary.
Produced by revolving the body, by heat and cold to the labyrinth wall and by galvanism.	Produced by moving objects before the eyes.

It has been shown by experimental nystagmus that the semicircular canals produce nystagmus in their own planes. That the flow of endolymph is the actuating influence upon the crista ampullaris, and that the direction of this flow governs the direction of the nystagmus. That the vestibular apparatus is the chief organ of equilibrium.

A few persons show a spontaneous vestibular nystagmus, which is characterized by appearing when the gaze is directed toward the external canthus of either side, and is increased if this position of the eyes is maintained.

THEORY.

The slow or vestibular component of the nystagmus arises in the end organ of the vestibular nerve and is transmitted to its own and the eye muscle centers, thence to the eyes. The quick component is cortical, from the gyrus angularis—and is a movement of recovery.

SYNCHRONIC THEORY.

It is impossible for me to conceive that one canal of a pair functionates while its companion is at rest, because in the experimental production of nystagmus by turning, both must be actuated at the same time by the flow of their endolymph. This flow is in opposite directions in the opposite ampullæ, and, therefore, moves the cupula toward the utriculus on one side and away from it on the other, at the same moment. There must be a direction of greatest and one of least physiologic activity. That canal governs in which the movement is in the direction of greatest physiologic activity, irrespective of which canal of a pair has been stimulated. There is, of course, a position of rest, which is assumed in both canals at the same time, when neither is functionating. I have shown the direction of greatest activity in the horizontal pair to be away from the utriculus —and in the anterior vertical pair, toward it. The action in the posterior vertical pair has been insufficiently studied, as they are difficult to actuate either by thermic influences or galvanism. The statements which have been made concerning them in this paper are statements of fact only. It is more than probable, however, that the principles governing their action are identical with those governing the other two pairs, modified only by their anatomic position and the positions of their cristæ in the ampullæ.

Nystagmus by turning has three stages: Primary, during turning; after nystagmus, when turning ceases; ultimate nystagmus, which sometimes follows after-nystagmus.

Nystagmus during turning is in the direction of turning, as a rule.

After nystagmus is in the opposite direction to turning, the only exception being when the head is inclined 90 degrees backward. It is either horizontal, rotary, vertical or compound, depending upon the position of the head during turning. The average duration after ten turnings is 41 seconds to the right and 39 to the left for horizontal; 24 to the right and 29 to the left for rotary nystagmus.

CALORIC NYSTAGMUS.

Is produced by the application of heat or cold to the tympanic cavity.

Cold produces nystagmus to the opposite side.

Heat produces nystagmus to the heated side.

The plane of nystagmus from cold is compound, horizontal and rotary. That from heat is rotary.

Temperature applied which is the same as the body temperature produces no reaction. When a temperature higher or lower than that of the body is applied to both ears at the same time, nystagmus occurs to either side by looking in the extreme lateral direction, but differs from the normal spontaneous by being more severe. It decreases with time. It ceases immediately upon fixation of vision straight ahead.

The accompanying symptoms are vertigo, nausea and vomiting, especially of rotary nystagmus.

Seeming movements of near-by objects, varying in direction with different individuals, and seeming movement of the body are quite different.

VESTIBULAR ATAXIA.

Reactionary movements of the body of an ataxic chaarcter can usually be elicited. This falling or reactionary movement is always in the opposite direction to the quick component of the nystagmus, in persons of stable nervous system. When this rule is violated, the person is neurasthenic or has other graver nervous lesion interfering with correct physiologic activity. It bears no relation to the intensity of the nystagmus artificially produced.

GALVANIC NYSTAGMUS.

Two to four milliamperes will produce nystagmus if one electrode is placed on the right and the other on the left tragus or mastoid. When one electrode is placed before the ear and the other held in the hand, 24 milliamperes will be required. Cathelectrotonus produces the same nystagmus as heat; anelectrotonus, the same as cold in caloric nystagmus.

The nystagmus is most plainly seen when the gaze is directed toward the extreme lateral position.

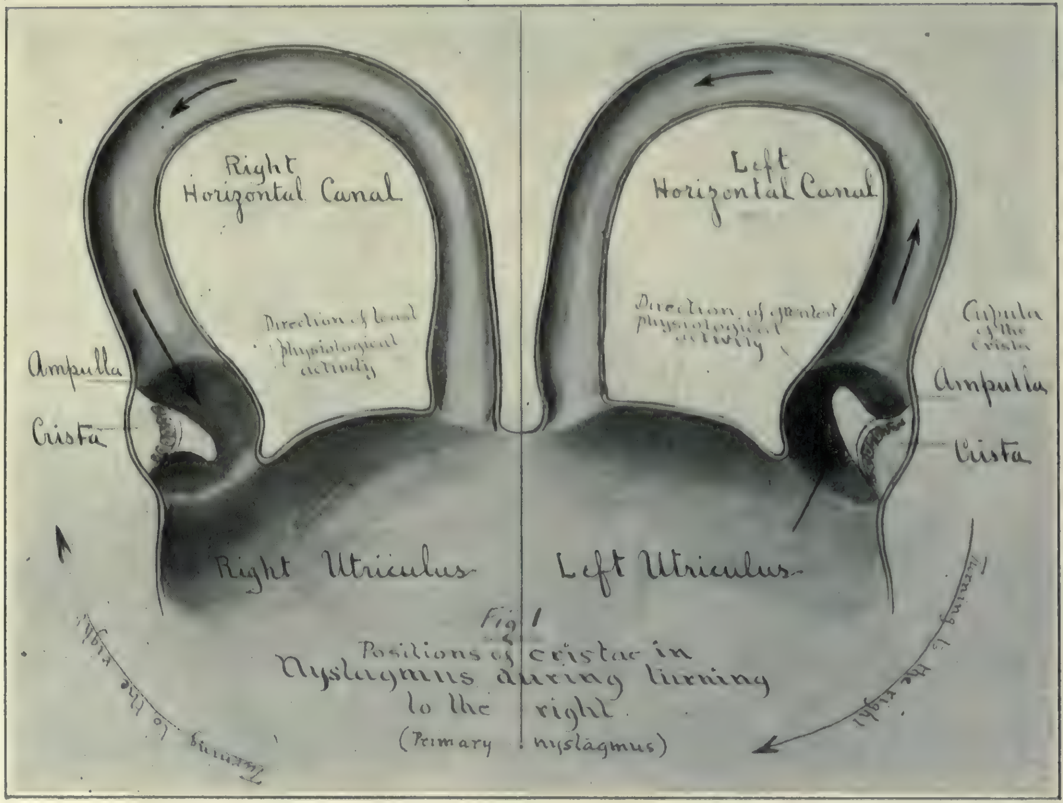
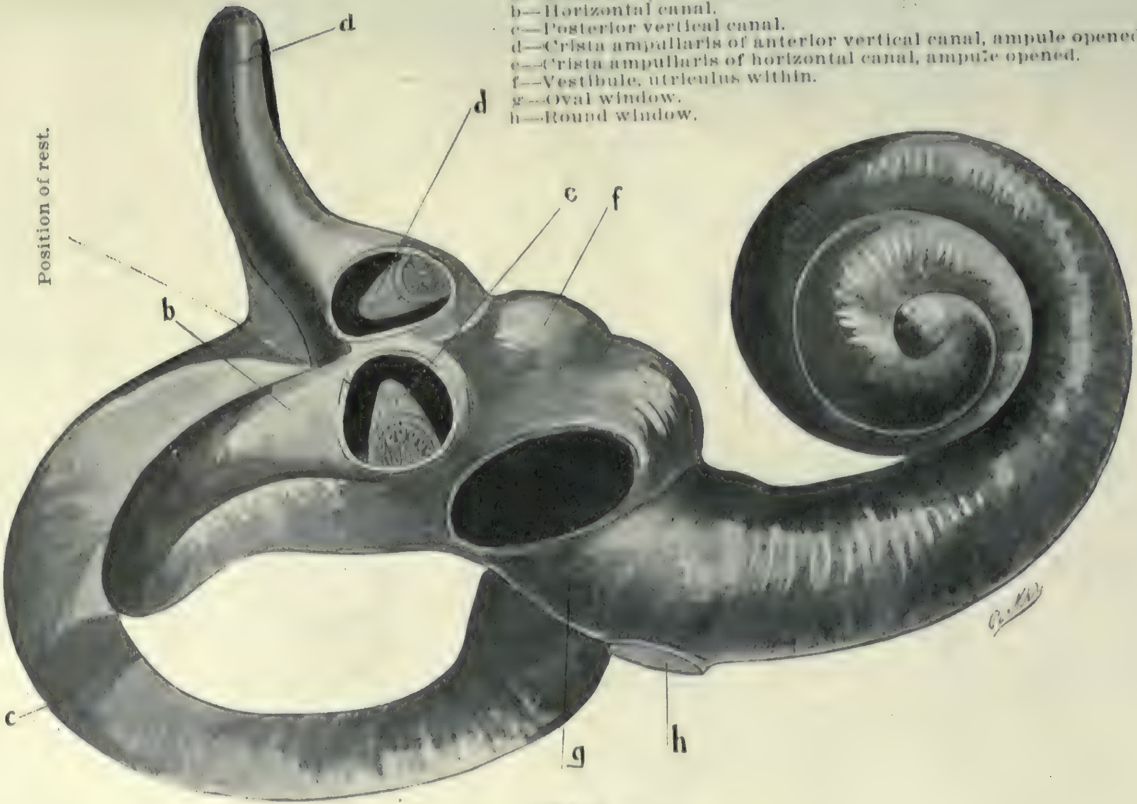
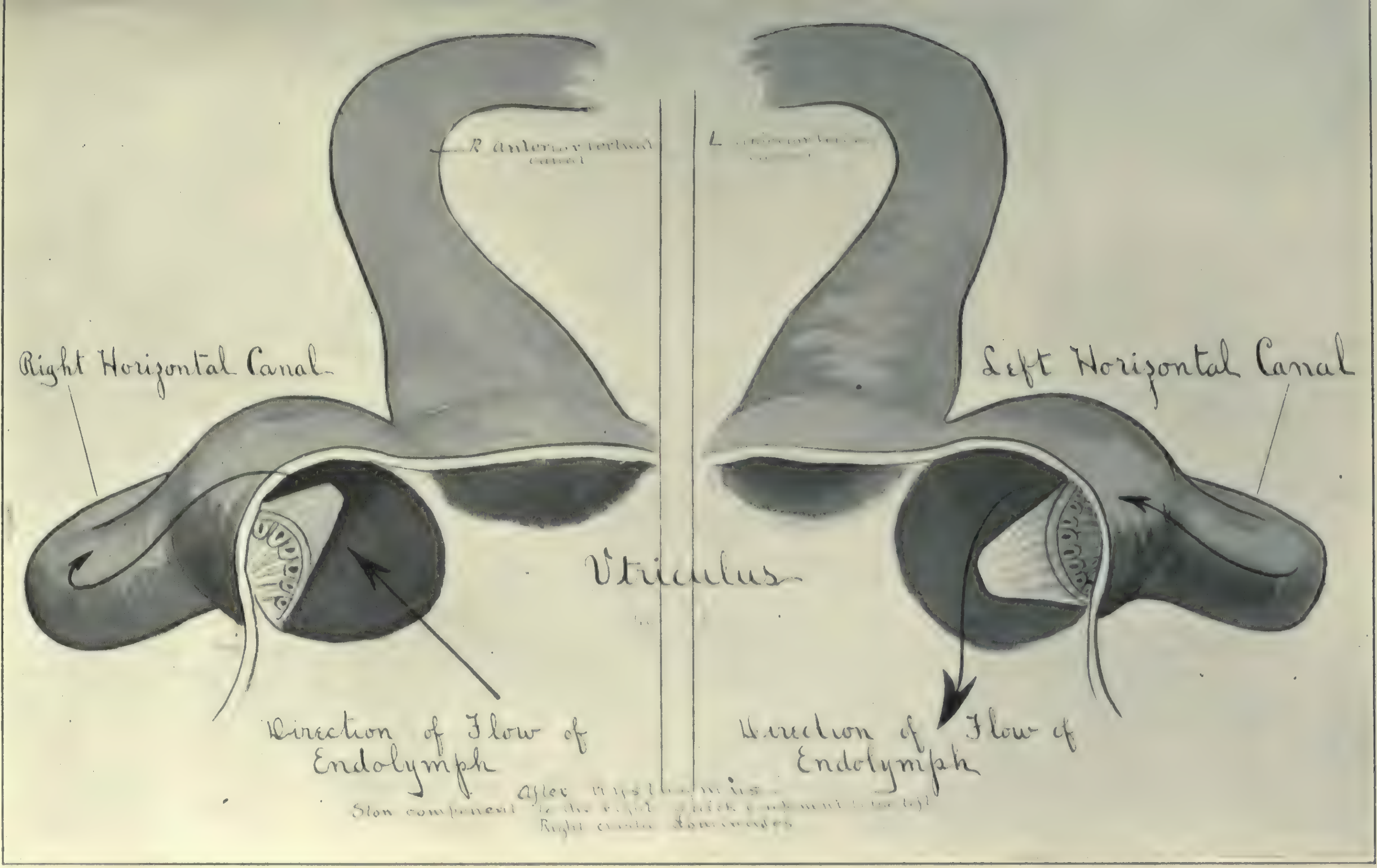


Fig 1
Positions of cristae in Nystagmus during turning to the right
(Primary nystagmus)



a—Anterior vertical canal.
b—Horizontal canal.
c—Posterior vertical canal.
d—Crista ampallaris of anterior vertical canal, ampule opened.
e—Crista ampullaris of horizontal canal, ampule opened.
f—Vestibule, utriculus within.
g—Oval window.
h—Round window.

Fig. 2.
Semi-Diagrammatic.


R anterior vertical canal
L anterior vertical canal
Right Horizontal Canal
Left Horizontal Canal
Utriculus
Direction of Flow of Endolymph
Direction of Flow of Endolymph

After nystagmus.
Slow component to the right Quick component to the left
Right canal dominates

XIX.

PRELIMINARY REPORT OF THE IMPROVED TECHNIC OF THE THIERSCH GRAFT FOLLOWING THE RADICAL MASTOID OPERATION.*

By Cullen F. Welty, M. D.,

San Francisco.

In a preliminary report of the improved technic of the Thiersch graft following the radical mastoid operation, it is very essential that the operation be done in a very thorough manner.

Every individual cell is destroyed until hard bone is encountered, or the dura, sinus or nerve uncovered. This final destruction of cancellous bone is best accomplished with a hand burr. It may be done with a burr driven by electricity; however, I prefer such burr for the bone of greater density. It is very essential that all the uneven surfaces be made perpectly smooth.

The outer part of the bony meatus must be removed sufficiently to be on a horizontal plane with the floor of the tympanic cavity. The posterior bony wall must be cut down to the floor of the newly made bony meatus. By this procedure more room is gained and the pocket which was formed by the tympanic cavity has been eliminated. In the removal of the posterior bony meatus and facial spur, great care must be exercised in not injuring the facial nerve. This is best overcome by chiselling the wall away with large chisels and working parallel to the nerve, so that in the event that the nerve is uncovered, it would not be cut. This particular point will enable the operator to remove more bone than any other, with more safety to the facial—in fact the facial cannot be cut by an experienced operator.

The mucous membrane of the tympanic cavity must be entirely removed. I literally mean that after a very thorough inspection, none can be detected. At this place it will be necessary in most cases to use a hemostatic agent of some kind, as hot saline solution, peroxid of hydrogen or adrenalin.

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*Read before the meeting of the San Francisco County Medical Society, October 11, 1910.

Most careful attention must be directed to the tube in order to remove the mucous membrane thoroughly.

The tympanic wall should be so thoroughly removed by chisel and made smooth by burrs, that the small searchers of Jansen's will not be arrested.

Everything that has been said so far is absolutely important in every radical operation. However, it is much more important when Thiersch grafts are to be applied, as any infection that may remain in the bone will ultimately destroy the graft and the purpose will fail of accomplishment.

The Neumann plastic should be made in preference to all others for this particular procedure, the upper and lower flap sutured in place, and the point of the V sutured to the auricle. The sutures to be used in holding the V part of the plastic should be catgut. The sutures for the upper and lower flap are best of catgut; if not, they must be removed when the skin-graft is applied.

The use of other sutures, if allowed to remain, may or may not cause trouble in the after treatment of the case.

The toilet of the operation having been completed, the patient is put to bed and is encouraged to go about as soon as possible. Four days following the radical ear operation, the Thiersch grafts are applied, this particular time being selected because the granulations are comparatively small; in some cases they are quite large. I have used the grafts earlier, but of late I have selected the fourth day as the best for all cases. In the near future I am going to use this same procedure in detail at my first operation. On the fourth day, patient being anesthetized, the operative field is cleaned in the usual way. The whole cavity will be found covered with granulations, all of which must be most carefully removed, special attention being directed to the tube. At this time I use hot saline solution as a hemostatic agent, inspecting the cavity from time to time; finally to reassure myself, I use peroxid of hydrogen several times. When I am satisfied beyond a question of doubt that everything is away, I put in gauze saturated with adrenalin; this gauze is held in the cavity under pressure by an assistant while the grafts are being prepared. At the time I begin my preparation of the ear, the nurses are preparing the leg or part from which the grafts are to be taken. In this preparation, bichlorid has never been used. Sterile salt solution is used in excess, following all the other aseptic procedures.

I try to get about three or four grafts one-half inch wide by one and one-half inches long. Some smaller ones one-fourth inch by one-half inch. Some of the grafts may be lost in preparation or in applying them.

The grafts are taken from the razor directly to the Jansen spatula, and after all edges are straightened they are put aside for use. When grafts are in readiness, the adrenalin tampon is removed from the ear. The cavity will be found to be absolutely dry, and if not, more adrenalin must be used; the cavity must be free from oozing blood or the grafts will not adhere.

The first one is fastened with a searcher into the tube, bringing it out over the floor of the tympanic cavity posteriorly. The second, superior to the first, brought back over facial into mastoid cavity. The third usually covers the remaining wall of the attic and antrum. The three that have been used are the larger ones. The uncovered areas that are now left are covered by the remaining grafts, the one being selected that will cover the denuded area best. Small pledgets of cotton are now used to fix the grafts,—they must be so small that they do not touch either surface while being put in place. The first one is put over the tube; the second firmly applied to the posterior inferior quadrant, the next over the stapes, and so on until all the grafts are held well in place so they will not be materially disturbed when a dry tampon is introduced. The size of this tampon will correspond to a piece of gauze four or six inches square. After the dry gauze, a similar piece of gauze is saturated with oil of vaselin, and packed within the mastoid cavity; after this a similar piece, in size larger or smaller as the occasion may demand, to fill the entire cavity made by the operation.

The posterior wound is now closed in the usual manner. It will be found that an additional tampon by way of the meatus will assist materially in holding the plastic in the way intended, resulting in a very large meatus, with cut surfaces all within the ear. This materially adds to the comfort of the patient as well as preventing a contracted meatus. The outside dressing is as usual. The ear tampons are removed on the fourth day. If there is any difficulty or pain in the removal of the tampons, contrary to the ordinary teachings, peroxid of hydrogen may be used in excess to soften and loosen the tampons, and stop the bleeding, so that the small cotton fasteners that are put in to hold the grafts in place may be seen and taken away.

In 50 per cent of the cases a white cavity will be seen; in fact this is always the case when time is taken to stop the bleeding that comes from the inner surface of the soft parts that have been sutured and could not be covered by graft. This is the improved technic of the Thiersch graft in the radical ear operation.

In fact a graft never adheres to the tampons so as to be torn from its attachments. I say attachments, because I purposely pulled one away for experimental purposes; it was so firmly attached that the ordinary Politzer ear forceps would slip off. I was compelled to use an anatomic forceps and hold with considerable strength in order to pull the graft away.

In some of the cases the outer layer of epidermis would loosen; this occurs in ten days or two weeks after the grafts have been applied; they always leave a delicate epidermis that hardens in a very short time. I hardly know how to account for the fact that in some cases the entire graft remains in place while in others the outer layer comes away. The only explanation that I can offer is that in some instances the graft is too thick. However, this does not seem to be serious, as the cases heal in about the same time. Occasionally it will happen that granulation tissue makes its appearance when the edges of the graft are not in perfect apposition. They are very easily destroyed with the ring knife. At the following dressing the denuded area will be found completely dermatized.

Occasionally excessive granulation tissue makes its appearance posteriorly in the region of the plastic. This is removed with curette and packed tight with gauze saturated with sterile oil of vaselin. Contrary to the teaching of today, bichlorid of mercury is used to irrigate the cavity. This is necessary where there is an unusual amount of pus or odor from secretion. In other instances where there is more debris than there should be, I always irrigate with the intratympanic canula and under inspection, so that the force of the stream is directed to the particular spot that requires attention. I also irrigate with normal salt solution and boracic acid.

As has been said before, the oil dressing is removed in four days or sooner if necessary. In two days a second dressing is made which includes an irrigation of bichlorid of mercury 1-3000, and from this time on it is dressed daily until complete recovery.

It is necessary to use the bichlorid irrigation at the second dressing to remove disagreeable odor that is caused by the oil of vaselin becoming rancid. This happened in all my cases, however, and I did not care to make a change until this report had been made. In a case operated upon a few days ago, I used ½ per cent solution of carbolic acid in paraffin oil, U. S. P., and to my surprise, there was no odor; besides, the mastoid cavity was in better condition than in any of my previously operated cases. In fact the case is so near well in two weeks, that it is difficult to find uncovered areas. I believe this antiseptic added to the oil will further materially improve the technic. This case is not included in those reported.

PREPARATION OF OIL.

I had recently made for me a 10 cc. ampoule of ½ per cent solution of carbolic acid in paraffin oil, U. S. P., or hydrocarbon oil; to be heated one-half hour at 150°C—and repeat the same procedure in twenty-four hours.

This has yielded better results than the plain Cheseborough oil of vaselin that has simply been sterilized.

The final procedure of every dressing is a thorough drying of the ear. Pulverized acid boracic is blown into the ear and then use is made of single small pieces of gauze one-half inch square with a small roll of gauze to fit snugly into the outer meatus. As a rule the bandage is left off ten to twelve days following the original operation. .

In several of the cases vertigo was complained of for some time. In three instances it has continued after the ear was entirely dry. The only explanation that I can offer is that of a circumscribed labyrinthitis that has not entirely recovered—there remains a hyperemia of the bony canal, or that the canal is simply covered by epidermis, and is more or less influenced by the atmospheric temperature. However, to offset this latter, I have packed the meatus and it did not seem to have any influence. Another reason that had occurred to me, that of pressure on the stapes of the graft.

The only cases that were excluded from this series of 21 cases, were one of labyrinth suppuration and two in which the dura was so diseased that it would not have been safe to use a skin-graft.

Case 107—hearing not improved. Can offer no explanation. In my history card she is marked lengthened Schwabach.

Case 119—hearing made worse. This case had an acute serous labyrinthitis which subsided; two weeks later had a similar attack.

Case 121-122—hearing made worse. Can offer no other explanation than an impaired cochlea as was shown by the Schwabach test. This patient had a circumscribed labyrinthitis as well. This is also one of the patients who has more or less vertigo and tinnitus. This is disappearing and I believe in a comparatively short time will be entirely gone.

Case 123—Perfect result but I have no way of measuring the hearing.

The eighteen cases show a remarkably rapid recovery; 4 cured in three weeks, 10 cured in four weeks, and 4 cured in six weeks. In the series of 18 cases, the hearing was improved in 14, 11 of them could hear a whisper 15 feet or more, and 7 could hear a whisper 25 feet or more.

In conclusion I make the statement unreservedly that every case of chronic suppuration is dangerous to the individual and should be operated upon, and that all cases will recover if operation is properly performed; that the hearing will be improved in the large majority of cases; that there is no danger associated with the operation provided the labyrinth is intact. This latter statement is based on approximately two hundred mastoid operations.

Case.	Age.	Sex.	Discharge.	Operative Findings.	Hearing Before and After Operation.		Duration of after treatment
					Before.	After.	
104	26	Female.	Childhood.	Cholesteatoma.	Whisper, 6 inches.	Whisper, 6 feet.	6 weeks.
105	14	Male.	2 years.	Cholesteatoma.	Speech, water 6 feet.	Speech, water 15 feet.	4 weeks.
107	28	Male.	Childhood.	Cholesteatoma.	Whisper, 3 feet.	Whisper, 3 feet.	6 weeks.*
108	19	Female.	Childhood.	Cholesteatoma.	Whisper, water 12 feet.	Whisper, water 26 feet.	4 weeks.
109	10	Male.	Childhood.	Cholesteatoma.	Whisper, 1 foot.	Whisper, 26 feet.	4 weeks.
110	14	Male.	Childhood.	Cholesteatoma.	Whisper, 1 foot.	Whisper, 25 feet.	4 weeks.
111	25	Male.	2 years.	Cholesteatoma.	Whisper, paper, 3 inches.	Whisper, 6 feet.	6 weeks.
113	33	Female.	Childhood.	Cholesteatoma.	Whisper, paper 3 feet.	Whisper, paper 20 feet.	3 weeks.
115	26	Male.	1 year.	Cholesteatoma.	Whisper, paper, 15 feet.	Whisper, paper 26 feet.	4 weeks.
117	16	Male.	Childhood.	Caries.	Whisper, paper 1 foot.	Whisper, paper 6 feet.	4 weeks.
118	12	Male.	5 years.	Caries.	Speech, 3 feet.	Whisper, chair 25 feet.	3 weeks.
119	16	Male.	2 years.	Caries.	Whisper, 25 feet.	Whisper, 3 feet.	4 weeks.*
120	9	Male.	7 years.	Cholesteatoma.	Whisper, 1 foot.	Whisper, 6 feet.	3 weeks.
121	29	Female.	Childhood.	Caries.	Whisper, 6 inches.	Speech, 1 foot.	3 weeks.*
122	29	Female.	Childhood.	Caries.	Whisper, 3 feet.	Speech, 3 feet.	4 weeks.*
123	4	Female.	3½ years.	Cholesteatoma.		Good.	4 weeks.*
124	30	Male.	Childhood.	Cholesteatoma.	Whisper, chair 2 feet.	Whisper, chair 15 feet.	5 weeks.
125	18	Female.	10 years.	Cholesteatoma.	Speech, 2 feet.	Whisper, 25 feet.	4 weeks.

*The duration of the after treatment dates from the day of the radical mastoid operation and not from the day of the graft which was four days later.

CASE 104.—26 years, female. Discharge from ear since childhood. Complains of occasional vertigo and tinnitus.

Examination.—No pain on superficial or deep pressure. Offensive discharge. Anteriorly and above part of the attic wall is destroyed. Below, granulations and a whitish mass. Weber to bad ear. Schwabach, short. Whisper 6 inches. Spontaneous nystagmus, negative. Caloric test positive. Hearing tube whisper, positive.

Operative Findings.—Attic, antrum and mastoid cells filled with cholesteatoma and pus. Sinus uncovered. Skin-graft as usual. Recovery, forty-two days. Whisper 6 feet, improved.

CASE 105.—Jos. C., 14 years. Two years ago had an acute otitis media following scarlet fever; the ear has continued to discharge ever since. For the last year has had more or less pain in the ear, occasional pain in mastoid region. Complains of vertigo and tinnitus at times.

Examination.—Extreme tenderness over tip of mastoid, membrane entirely destroyed, a bony fistula just over and in front of the short process. A fetid discharge. Weber to bad ear. Schwabach, lengthened. Rinne, negative. Speech, "water," 6 feet. Spontaneous nystagmus, negative. Caloric test positive, exaggerated. Hearing tube, positive. Fistula symptoms, negative.

Operative Findings.—Large cholesteatoma, his attacks of dizziness increased by treatment, due probably to the fact that the cholesteatoma absorbed more water and thereby produced pressure on the horizontal canal. The canal stood out quite prominently. In my effort to remove all the carious bone, I produced a fistula. This did not seem to have any effect whatsoever, as he did not complain of dizziness after the operation. On the fourth day, graft. Has made an uninterrupted recovery. Conversation, "water," 15 feet. Twenty-eight days complete healing.

CASE 107.—Female, 28 years. Alcoholic and drug fiend. Discharge from ear since childhood. Headache over this side of the head. No dizziness.

Examination.—Right ear, large polypus almost filling meatus, offensive discharge. Whisper, 3 feet. Weber to bad ear. Rinne, negative. Spontaneous nystagmus, negative. Caloric test, positive. Hearing tube, positive. Cholesteatoma. Whisper, 3 feet. Six weeks complete epidermization.

Case 108.—Female, 23 years. Married, three children. Discharge from both ears since childhood. Two years ago, had report in right ear, was so ill following that was compelled to go to bed. Dizziness and vomiting. Since then does not hear from this ear. Discharge stopped. For some months past has been having dizzy spells and vomiting following pain on left side of head.

Examination.—On pressure pain on whole side of head, especially over tip. Foul, offensive discharge. Weber to this ear. Schwabach, normal. Rinne, negative. Spontaneous nystagmus, negative. Caloric test, positive. Hypersensitive. Vertigo and tinnitus present. Hearing tube, positive. Fistula symptom, negative. Hearing, whisper, "water," 12 feet.

Operative Findings.—Cholesteatoma, horizontal canal projecting well into the cavity. During the time of healing and some time since patient has complained of dizziness—with lessened severity and at present some months after operation has it occasionally. The only explanation that I can offer is that the horizontal canal is covered only by graft, thereby exposed to the air, or from pressure of graft on stapes. Hearing, "water," 26 feet. Four weeks.

Case 109.—Male, age 10. Has had discharge from ear since three years of age. Was under continuous treatment until one year ago. Since then the ear has been syringed by mother once daily. Complains of pain back of ear, pain over whole side of head, acute exacerbation.

Examination.—Whole side of head painful to touch. Mastoid exquisitely sensitive. Temperature, 100. Foul, offensive discharge. Bulging posterior wall. Weber to this ear. Rinne, negative. Schwabach, normal. Vertigo present. Occasional tinnitus. Spontaneous nystagmus, negative. Caloric test, positive. Nystagmus after turning, 40″-40″. Hearing tube, whisper, positive. Hearing before operation, 1 foot.

Operative Findings.—Cholesteatoma, dura and sinus uncovered by caries. Grafts four days later. Made good recovery. Hearing at 25 feet. Four weeks duration of treatment.

Case 110.—Age 14. For past year has had discharge from left ear, has been under treatment all the time. During the last year has had dizzy spells with increasing frequency. Has had pain back of ear several times during last year. Complains of frontal headache.

Examination.—Painful on deep pressure over the mastoid. Foul, offensive discharge, masses of debris, probably cholesteatoma. Treated by intratympanic irrigation. Two weeks later returned with an acute exacerbation of the chronic suppuration, increasing dizziness. Weber, bad ear. Rinne, negative. Schwabach, about normal. Vertigo and tinnitus present. Spontaneous nystagmus, negative. Caloric nystagmus, positive, hypersensitive. Nystagmus after turning 35″-36″. Hearing tube, positive for whisper. Hearing, 1 foot.

Findings.—Cholesteatoma, attic, antrum and mastoid cells. Horizontal canal prominent from destruction of bone. In removing carious bone from horizontal canal a fistula was produced. Spontaneous nystagmus to the opposite side for a few days, no other symptoms. Graft four days after operation. Uninterrupted recovery. Hearing at 25 feet.

Case 111.—Male, age 25. Chronic discharges for one year and a half. Complains of pain during the night. Frequent attacks of vertigo. Headache over this side of head.

Examination.—No pain on deep pressure or percussion. Foul, offensive discharge. Masses of epidermis. Under treatment dizzy spells increased in frequency. Drum membrane entirely destroyed and whitish masses seen high up. Weber to this ear. Schwabach, lengthened. Whisper, "paper," 3 inches. Hearing tube (7 feet), whisper positive. Caloric test, positive, exaggerated. No spontaneous nystagmus.

Operative Findings.—Cholesteatoma and a necrotic mastoid. Horizontal canal stood out quite prominently. I explain the increasing vertigo by the fact that the cholesteatoma absorbed some of the water, making more pressure on the horizontal canal. Whisper, 6 feet, 40 days.

Case 113.—Female, age 33. Discharge from ear since childhood. Headache on same side of head, back and front. No dizziness. Had an acute exacerbation 3 or 4 months ago. Never treated before.

Examination.—Mastoid sensitive on deep pressure. Membrane destroyed, masses of cholesteatoma protruding from above. Weber to this ear. Rinne, negative. Schwabach, shortened. Spontaneous nystagmus, negative. Caloric test, positive. Whisper, "paper," 3 feet.

Operative Findings.—Attic and antrum filled with a mass of cholesteatoma. Some few mastoid cells carious. Skin-graft, fourth day. In four days, first dressing. Cavity white. Completely healed in three weeks, twenty-one days.

Case 115.—Male, age 26. Patient gives a history of discharge for one year. Some vertigo. Has been treated for six weeks by intratympanic irrigation.

Examination.—No pain on deep pressure or percussion. Foul, offensive discharge. Cholesteatoma. Entire destruction of membrane. Weber in both ears. Schwabach, short. Rinne, positive. No spontaneous nystagmus. Caloric nystagmus, positive. Hearing, whisper, "paper," 15 feet.

Operative Findings.—Large cholesteatoma filling antrum and extending into mastoid cells. Skin-graft in four days. Dressed in four days and so continued daily until well, twenty-eight days. Whisper, "paper," 26 feet and more.

Case 117.—Male, age 16. Discharge from both ears since childhood. Left ear operated three times in New York City. Reoperated by myself. Completely dry. No hearing prior to operation.

Right Ear Examination.—Foul, offensive discharge. Masses of epidermis, probably cholesteatoma. Occasional dizzy attacks. Entire destruction of membrane. Whisper, "paper," 1 foot. Weber to discharging ear. Rinne, negative. Schwabach, shortened. No vertigo or tinnitus. Spontaneous nystagmus, negative. Caloric nystagmus, positive. Fistula symptoms, negative.

Operative Findings.—Extensive caries of the entire mastoid. Skin-graft in usual way. Recovery in four weeks. Whisper, "paper," 1 foot; after whisper, "paper," 6 feet.

Case 119.—Male, age 16. Two years ago had pneumonia. Acute mastoiditis requiring operation, during the height of the pneumonia. Made complete recovery. Ear well for several months, would discharge at intervals. In two years' time the discharge disappeared entirely ten or twelve times. Decided a radical operation necessary.

Examination.—No pain on superficial or deep pressure.

Heart shaped perforation in inferior quadrant. Weber to this ear. Schwabach, normal. Rinne, positive. Whisper, "water," 25 feet. Caloric test, positive.

Operative Findings.—The cavity which had been made by the former operation had been entirely filled with bone which was composed of small and large cells which were infected. The whole tip removed. The cell extended almost to the median line of the posterior wall of the cranium. The right angle incision closed. Second day after operation marked nystagmus to the opposite side; repeated vomiting. Could hear in this ear. Diagnosed serous labyrinthitis.

Skin-graft fourth day. Immediately after this, vertigo, nausea and vomiting disappeared. Was sitting up the following day.

At my first dressing I found all the clamps and stitches taken out. I think the patient did this. The whole cavity was very much infected. Dressed daily. Improving. Twelve days later so dizzy that cannot leave his bed. Vomiting at intervals for two days. Hearing. No temperature. Two days later some dizziness. No vomiting. Nystagmus somewhat lessened. Recovery in four weeks. Whisper, "glass," 3 feet. Wound back of ear closed August 1st. No more dizziness. Nystagmus almost gone.

Case 120.—Male, age 9. Has had discharge from ear for last seven years. Has had repeated acute exacerbations, present one began three days ago. No discharge at present. Complains of vertigo and tinnitus.

Examination.—Left side of head painful to pressure. Superficial temperature of this side increased in comparison with other side. So much bulging of the posterior superior canal that it almost fills the meatus. Temperature 102.2°. Weber to this ear. Schwabach, normal. Rinne, negative. Whisper, "paper," 1 foot. Caloric, positive.

Operative Findings.—Cholesteatoma. Dura uncovered by caries. Sinus uncovered by caries. Recovery in three weeks. Whisper, "paper," 6 feet.

Case 121-122.—Female, age 29. Offensive discharge from both ears since childhood. One year ago right ear stopped discharging. Complains of dizzy spells.

Examination.—Right ear, not sensitive to pressure or percussion. Masses of epidermis. Foul smelling cholesteatoma. Membrane entirely destroyed. Weber to both ears. Schwabach, somewhat shortened. R. E., whisper, "water," 6 inches. Spontaneous nystagmus to the opposite side. More pronounced to the right side. Caloric reaction positive. Fistula symptoms negative. Operation in usual way.

Findings.—Caries of mastoid cells and antrum. Foul pus. Dura uncovered by chisel. Fourth day, skin-graft. Complained of some pain. Dressed third day, one bleeding followed. Some pain following day. Changed dressing, removed two cotton balls. Entire graft in place, cavity white, bleeding from under side of outside flap.

Left ear, no pain on deep pressure or percussion. Foul, offensive discharge. Masses of epidermis simulating cholesteatoma. Membrane entirely destroyed. Weber in both ears. Whisper, "paper," 3 feet. Schwabach somewhat shortened. Rinne, negative. Spontaneous nystagmus to both sides. More pronounced to opposite side. Caloric reaction positive. Very marked with small amount of water. Fistula symptoms negative. Operation usual way.

Findings.—Caries of mastoid cells and antrum full of pus. Sinus uncovered by chisel. The horizontal canal was quite prominent. The cancellous bone had been destroyed by caries. Fourth day, skin-graft. Dressed third day. Some bleeding from outer flap. Dressed following day because of pain in other ear and some dizziness. Cavity absolutely white. Right ear, speech, "water," 1 foot. Recovery in three weeks. Left ear, speech, "coffee," 3 feet. Recovery in four weeks. More or less vertigo, some tinnitus in left ear. The vertigo is disappearing gradually.

CASE 123.—Female, age 4. Discharge from ear three and one-half years. Has had severe pain back of the ear repeatedly. About three weeks ago began to have pain back of ear. One week ago began to swell back of ear.

Examination.—Large swelling back of ear, fluctuates. Increased surface temperature. Exquisitely sensitive. Offensive discharge. Heart shaped perforation low down. Could not make fork examination. Patient hears in this ear. Caloric reaction, positive.

Operative Findings.—Destruction of the greater part of the posterior osseous wall. Cholesteatoma filling up the attic and antrum which were quite large. Graft and after-treatment carried on in usual way. Cured in four weeks. Good result. Must be good hearing from appearances.

Case 124.—Male, age 30. Discharge from ear since infancy until five or six years ago when the discharge stopped entirely. Three or four days ago began to have pain back of the ear and over this whole side of the head. Complains of vertigo and tinnitus.

Examination.—Very sensitive over mastoids. Whole side of head sensitive. Ear perfectly dry. Entire destruction of membrane. No bulging of posterior wall. Weber to this ear. Rinne, negative. Schwabach, about normal. Whisper, "chair," 2 feet. No spontaneous nystagmus. Caloric reaction, positive Fistula symptoms, negative. Hearing tube (7 feet), whisper, positive.

Operative Findings.—Large cholesteatoma with pus under considerable pressure. Dura uncovered in temporal region by caries, was considerably discolored. Was a question if this particular case was safe for graft. Grafted fourth day. Whisper, "chair," 15 feet. Thirty-three days.

Case 125.—Female, age 18. Hip-joint disease some four years ago, left with deformity. Discharge from ear for last ten years. Never has had pain in ear or back of ear. Headache on this side of head and attacks of vertigo.

Examination.—Not painful on deep pressure in mastoid region. Offensive discharge, entire destruction of membrane. Hearing, speech, 2 feet. Weber to bad ear. Rinne, negative. Schwabach, shortened. Spontaneous nystagmus, negative. Caloric nystagmus, positive. Fistula symptoms, negative.

Operative Findings.—Sclerosed mastoid, chloesteatoma. Horizontal canal stood out from surrounding bone. Skin-graft on fourth day in usual manner. Ear dry in four weeks. Hearing, whisper, twenty-five feet.

In discussion Dr. Horn reported seven cases of skin-graft by my method with approximately the same results as to time in healing and to the improvement in hearing.

SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE.
SECTION ON OTOLOGY.

October 14th, 1910.

DR. JOHN B. RAE, CHAIRMAN.
DR. JOHN R. PAGE, SECRETARY.

PRESENTATION OF PATIENTS.

A Case of Sinus Thrombosis With Extensive Accumulation of Free Pus in the Vein; Recovery After Resection of Internal Jugular.*

BY ROBERT L. LOUGHRAN, M. D.,
NEW YORK.

DISCUSSION.

DR. JOHNSON inquired whether the sinus infection occurred after the first operative procedure, or if it existed prior to operation. What was the condition of the sinus at the time the doctor made the first operation and how long after that did he discover the necrotic spot on its wall? Were there pulsations in the sinus, and if so, for how long did they continue after the first operation?

DR. LOUGHRAN replied that he thought that the sinus was infected from the time the patient had the chill and that the infection had advanced without symptoms appearing in the exposed portion of the sinus wall until the condition was well advanced. Pulsation of the sinus was present at the time of the second operation and had been present previously at the time of the first operation. Pulsation in the exposed sinus was no indication that blood was circulating through it.

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*See page 134.

It had been clearly demonstrated that pulsation could be present in a section of the sinus that was completely thrombosed, this pulsation being due to transmission through the thrombus of a circulation going on in the sinus above the thrombosed area. Pulsation was, therefore, no contraindication to the presence of a thrombus.

In response to an inquiry from Dr. Dench as to whether a blood culture had been made, Dr. Loughran said that a blood culture had been attempted on two occasions without success, owing to the impossibility of securing a blood vessel of sufficient size to obtain enough blood for examination.

Paper: Mechanical Aids to Hearing.*

By Percy Fridenberg, M. D.,

New York.

DISCUSSION.

Dr. Dench agreed with Dr. Fridenberg that the greater attractiveness of the surgical side of otology had caused a neglect of this side of it. He himself has attended most of the sessions of the section on otology, and this was the first time that he had ever heard a paper on the artificial aids to hearing. Some of his patients use these electrical instruments with advantage, and others derive no benefit. Some of them are obliged to attend board meetings, and they find that this instrument placed on the table is a great aid to them. They can sit about the table and hear practically everything that is said.

Regarding the portable type, where receivers are worn either on the waistcoat or on the dress, they are not very valuable. One of his patients is frequently called upon as an expert witness, and he found that whether addressed by the counsel or the bench, or any other member of the court, he was able to hear better with this instrument than without it; but the portable instruments are not of much value. That is due to this carbon contact. If a current of electricity is passed through the particles of carbon for a considerable time polarization will result. This occurs with the table instruments, but more with the portable ones. If you have polarization the instrument is dead. That is remedied by knocking the instrument against some solid object, when the polarization is destroyed.

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*See page 138.

There have been some rather amusing experiences with these instruments. One man said: "I am all right; it is not necessary for me to have any treatment, for I hear perfectly well." He was not really hearing at all, but was reading the lips, for when the instrument was examined, it was found to be turned off. The switch can be turned off and on, and he was using the instrument with the switch turned off.

In a certain small proportion of cases these portable instruments do some good. Dr. Dench is inclined to advise patients to use the simpler forms—one of the horns or trumpets rather than the complicated electrical instrument; the electrical instrument placed on the table is the choice in a certain type of cases.

With reference to the instruments which depend on the continued stimulation of the auditory nerve, they are to be condemned absolutely. He has a number of cases under observation where these instruments have been used for improvement of the hearing, and without exception they are worse after its use than before.

He agreed with Dr. Fridenberg that the cotton pledget is the best artificial drum membrane we have. There is one advantage in using this artificial drum, for having used them for a certain length of time the hearing is better than before the artificial device was tried. That is owing to the systematic massage which takes place. Just as a man with a stiff elbow may be told to carry a scuttle of coal up the stairs every day, and by exercising the joint it recovers its function. Undoubted advantage has been derived from the use of this device and, contrary to Dr. Fridenberg's experience, he has not always found them irritating. One patient used one of them for three months without trouble. The patients get so that they can introduce the artificial drum better than the doctor himself, for they are able to tell when the pledget is in the proper place. You have only to be careful that they observe surgical cleanliness—that the cotton is sterile, the albolene with which the cotton pledget is moistened is sterile, and that the patient washes his hands before forming the cotton pledget. If these points are attended to there is not apt to be trouble.

With reference to the concha tube—that is an old idea of Politzer's, and it will be found in one of his books. He says that introducing a small rubber tube into the auditory meatus will frequently help the hearing in old patients. In addition to this separation of the meatal walls, you have the vibration which is transmitted from the cartilaginous meatus to the deeper structures.

Dr. Dench said that he had been much interested in noticing the different forms of sound reflectors which Dr. Fridenberg had presented. Light and sound are reflected in the same way. The idea is to collect the sound waves and throw them into the ear in parallel waves. The curve of the collector or resonator—the reflector—must be more or less parabolic so as to give the maximum amount of sound at the entrance of the tube.

DR. DUEL said that his experience coincided with that of Dr. Fridenberg and Dr. Dench. With regard to the massage vibrator apparatus which is sold with the electrical device for hearing, he had a number of highly intelligent patients who, as shown by careful functional tests, have grown steadily worse under its use, and he wished to add his word of condemnation of it.

DR. KERRISON said that Dr. Fridenberg's remarks on mechanical aids to hearing were both interesting and of practical value. As bearing upon the mechanism of artificial drums, Dr. Kerrison wished to refer to some recent experiments by Dr. Barany of Vienna. Dr. Barany, in common with other otologists, found difficulty in explaining why the application of an artificial drum was in some cases successful and in others of no advantage to the patient. He had assumed that the cases of failure were due to the difficulty of accomplishing proper contact with the head of the stapes or incudostapedial articulation. In order to throw light upon this he tried the following experiment, using as subject a patient with chronic suppurative otitis media, whose drum membrane was practically destroyed. Into this patient's ear a small quantity of mercury was poured. When the patient's head was bent toward the side not experimented upon, so that the mercury covered the inner tympanic wall and both labyrinthine windows, it was found that the hearing was entirely cut off. When, however, the head was partly raised to the upright position, it was found that a marked increase of hearing was accomplished. Examining the ear, it was found that the mercury with the head in this position covered the niche of the round window, but was not in contact with the oval window. Again, in order to elucidate this phenomenon, Dr. Barany had constructed a small glass model of the ear, consisting simply of a small glass tube with a tubular depression or prolongation from the lower end, this being designed to represent the niche of the round window. It was found that when mercury was dropped into this tube, it quickly filled the bottom of the tube proper, but did not enter the small tubular prolongation from which the mercury was always excluded by a column of air. Returning now to the experiment with his patient, Barany assumed that the mercury apparently covering the round window did not in reality enter this niche, being excluded therefrom by a column of air which invariably separated the body of the mercury from the membrane of the round window. Barany's theory, which seems to be logical, is that the deafness in cases of destruction of the drum membrane is due frequently, not to fixation of the stapes, nor to structural closure of the round window, but to the fact that sound waves entering the auditory canal strike simultaneously upon both the foot plate of the stapes and the membrane of the round window and that, therefore, the membrane of the round window is prevented from compensating for the movements of the stapes. In Barany's mercury experiment, however, the inertia of the body of mercury prevents sound waves from affecting the membrane of the round window, and the column of air between the mercury and the membrane of the round window enables this membrane to compensate for the movements of the stapes, thus enabling the latter to transmit sound waves through the labyrinthine fluids.

Dr. Smyth asked Dr. Dench to be a little more specific in regard to his method of introducing the pledgets into the ear.

Dr. Dench said that he takes the ordinary cotton applicator and winds the cotton around it, allowing the cotton to project beyond the end of the applicator. Roll it very firmly on the applicator, then pat down the cotton over the top, like a mushroom; then slipping it from the applicator, cut off a part of the long shank, leaving perhaps an eighth of an inch projecting, or the patient would be apt to pull it out. This is moistened in sterile albolene, then put on a sterile gauze towel, which takes off the excess of albolene. The pledget is then taken with a pair of fine forceps and introduced into the ear, directing it carefully until it is laid directly over the head of the stapes. It usually has to be shifted from side to side and up and down until it is as nearly over the head of the stapes or the oval window as you can get it. By guiding it with a fine applicator you will find the position in which the patient will hear best. At first you have to make several trials, but as you use it more and more the patient will tell you where to place it. In fact, some patients can place the pledget better than the surgeon himself. One of these pledgets was left in the ear of a patient for nearly three months, and there was no discharge from the ear.

In reply to an inquiry as to whether the ear was cocainized, Dr. Dench answered in the negative.

Dr. Heller said that working along these lines Neumann and Alexander found that the cotton did not remain sterile, and they looked about for something which would remain sterile; they made experiments with silver and gold foil, and obtained some very good results. He himself has tried it in one or two cases since his return, and the chief difficulty is to get a mass in that will stay. The minute silver foil is touched it will fly over and lump. Neumann and Alexander, however, have used it in a number of cases where it worked very well and stayed in place for several days.

Dr. Dench said that he had used this form in cases where the opening was particularly large. but in cases where there is simply a perforation he makes use of a paper disc—using a piece of moderately thin paper, such as foreign bond paper which is very thin and very tough. Cutting a circular disk, it is sterilized in alcohol and bichlorid (1-3000) and then laid over the perforation. The result in some cases is really marvelous.

Dr. Voislawsky said that he had had one such case in which he made use of cigarette paper, placing it over the drum membrane, and it stayed in place for several days; but when the patient reported he had an acute condition which developed into a mastoid and became very serious. It may have been due to faulty technic, or may have been due to an infection which was shut in, but he has not tried it again. However, if Dr. Dench has used it successfully for many years, he felt tempted to try it again. This case was a perforation of long standing—at least ten or fifteen years.

Dr. Dench inquired whether the ear was dry, and Dr. Voislawsky replied that he could not now say. It happened some eight or nine years ago, and he had not spoken of it before, but he recalled that he had moistened the paper and sterilized it.

Dr. Dench said that of course if the ear is not surgically clean and this pledget is inserted, a lot of damage may be done, although he himself frequently covers a perforation in an acute case, when the discharge has ceased for twenty-four hours. He puts a piece of paper over the membrane and seals it up, for the field is sterile and the drum will heal more quickly than if left exposed to the air. There is a certain amount of tension and the cicatrix will stretch unless supported. In such instances, however, one must be very careful, and examine the ear every day.

Dr. Jarecky said that he had been using cotton in those cases where the drum membrane was missing, not only as an aid to hearing but as a curative agent. One case came to him with the ear closed with paper in which the mastoid was involved and which he operated. Since that time he had used cotton, not wet but dry. In the old suppurative cases which were dry, he wiped out the cavity with an alcohol-bichlorid solution and then applied the cotton to close the whole perforation. This could stay in for a week or more, as long as it remained dry. In the more recent cases, in which the discharge had diminished to a slight quantity, he used the cotton but changed it daily or every other day. In these cases the cotton sometimes adheres to the opening, and in removing it a crust comes away which often starts the healing process. Sometimes it is better to moisten the cotton before removing it. The pledget of cotton must be flattened well, as any filaments inside the perforation produce a sensation of noise very disagreeable to the patient. He has had no trouble with any of his cases, and found a great improvement in the hearing of those cases which are attended to regularly.

Dr. Johnson said that doubtless all had seen many suppurative ear cases where patients have been trying patent ear drums and have come later to the otologist to have them taken out after they had been worn for considerable periods of time; also he had known those who could put them in, the result, as to hearing, being better than the otologist could attain. He has also seen cases which have heard very well with the Toynbee ear drum. This drum, made with a plated wire stem, was sold to a great many people some time ago under a special name for $5. He would like to know how many of those present had seen suppurative cases which have gone on to mastoid disease where artificial drums had been worn. Many of these people put the drums in themselves, and it is a question whether their methods were very aseptic, still it is a very rare thing for mastoid disease to develop which can be traced to the use of any mechanical appliance. In relation to the electrical devices by any names, there are cases in which they are of great benefit, especially for the collection of musical sounds as at the theater or opera, and the doctor said he could recall two cases who would not be without them for this purpose.

Dr. Johnson said that he knew at least two patients who were much benefited by the electrical apparatus in listening to music and conversation, and in the theaters. While many are not willing to persevere with the electrical aids, these persons use it carefully and scientifically. Many cast them aside with inadequate trial, saying that they are no good. There are little noises and sounds where they make connection between the battery and the resonator, and all of these things disturb them at first. It is largely a matter of education. The ear has to be educated to use an electrical apparatus. The conditions are absolutely changed when using them, and the sounds must be analyzed as they come through the apparatus. They are certainly accentuated. These two patients have attended the opera with increasing deafness, and have finally got cured. At first they could get no pleasure out of it.

Dr. Dench said that these electrical apparatus had been introduced into many of the churches and several of his patients really enjoy the sermon.

Dr. Duel said that in support of Barany's position in regard to the difference of balance in the two windows, as described by Dr. Kerrison, he recalled an experiment he himself had made some years ago. He had been using pledgets such as Dr. Dench had taught him to make many years ago, and not succeeding with a patient he made a stiffer and larger stem and covered it with collodion, then cut it off, leaving a pretty long stem and making rather a heavy appliance. Much to his surprise, when this was inserted into the patient's ear, after some manipulation, a striking improvement in the hearing suddenly occurred. It was left in the ear, and when the patient reported the next day she said that this improvement had lasted for a certain number of hours until the appliance slipped out of position. The experiment was repeated, and after a number of trials it was found that she could adjust the artificial drums better than he himself could. As she lived far from New York, and was anxious to have the relief they afforded, he devised a method by which she could make them herself with the aid of a piece of wire roughened and cut the proper length. This patient wrote to him at long intervals for a number of years and repeatedly reported great improvement in hearing by this method. If Barany's contention is correct, that it is the difference in the balance, then this false drum—heavier than the light ones commonly used—had been the cause of the greater improvement. He had tried this same method a number of times since, and on a few occasions had obtained striking results, but there had also been many failures.

Replying to a query from Dr. Dench, as to whether the mushroom part of the pledget was moist or dry, Dr. Duel said that the large flat part was made perfectly smooth with collodion and dipped in vaseline before it was inserted.

Dr. Fridenberg said that he had forgotten to mention that in their circulars the acousticon people claim that they adapt different types of instrument to different kinds of deafness, and they recommend that the patients come to their office to be fitted. He went to see what their adaptation consisted of, and found that they have four or five different receivers. The only effect of that is to shut out a certain number of sounds—there is no selection of sound as it approaches. He had thought that they might have something like the apparatus used with the telephone receiver; it would be a very great improvement if we could have low tones transmitted in a high frequency wave. They simply have a low intensity which is easily set in motion. That does not give so loud a sound but a great deal of vibration; the higher the resistance to the wave the less intensity has the sound, but also the less vibration from the sound, and in that sense there may be some advantage in having the patient test which instrument suits him best; but after all we have to have them try one or two different forms of instrument. If a patient is sent to the shop and a trolley car is passing while the test is being made, they cannot test hearing accurately.

As Dr. Dench had said, there is no doubt that auto-suggestion plays a large part in this matter. If a series of cases could be studied carefully and tested with these various instruments, we would gain some very valuable information. In the cases mentioned tonight, there was a history of decided improvement after using the drum. What kind of cases were these? There are a number of little points that have to be taken into consideration. Careful tests of hearing must be made with voice and tuning forks. An accurate diagnosis of the form of ear disease is essential.

There are many ways in which patients who are hard of hearing can be helped without having to wear a hearing tube. They should be encouraged to study lip reading. That is very important. Another way is for those addressing them to speak more clearly. It is not always the loudness of the voice; it is the clearness of enunciation. Another important point is exercise of speech for those who are hard of hearing. One thing that they suffer from is not knowing how loudly they themselves are speaking. The friend to whom he had referred said that he would like some one to tell him how loud he was speaking. He had no guide in his own ear.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

November 11, 1910.

A Case of Cerebellar Abscess Presenting Certain Features Suggestive of Labyrinthine Suppuration; Differential Points; Operation; Recovery.*

BY PHILIP D. KERRISON, M. D.,

NEW YORK.

DISCUSSION.

DR. DENCH said that Dr. Kerrison had summed up the treatment in saying that he did not manipulate the parts too much. We have probably all been exploring cerebral cavities too freely for pus. If the pus is evacuated with as little manipulation as possible the chances are better than if an attempt is made to clean out every nook and cranny of the abscess cavity. The brain will take care of a certain amount of suppuration the same as any other viscus in the body. Dr. Kerrison had simply put in a drain and allowed the pus to find its way to the surface. He disagreed, however, with Dr. Kerrison's statement that the caloric reaction in this connection made the case a unique one.

DR. KERRISON, in response to Dr. Dench's statement that several cases in which cerebellar abscess had been the direct cause of loss of vestibular irritability had been reported by Dr. Neumann, said that he believed that Dr. Dench was in error. He had discussed this particular point with Dr. Barany when recently in Vienna and he believed that up to that time no such case had been recorded.

Replying to Dr. Rae, as to whether any other than the caloric tests had been applied. Dr. Kerrison said that the patient at the time was very ill and could not stand, so that rotation tests were not tried. Her hearing is now very good. The caloric reaction had been recently retested, and the result was absolutely negative.

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*See page 43.

Demonstration and Comparison of the Various Electric Suction Massage Vibrators.

Dr. Wendell C. Phillips said that he wished to show the difference in the working of these electric vibrators in order to call attention to the fact that certain patented and much advertised ones possess no advantages over those which can be obtained in the open market.

The first apparatus shown was the auricular pressure and suction vibrator which is rented to physicians for so much per month and is not supposed to be on the market for sale, though this one had been purchased by the owner after having rented it for some months. He demonstrated that it was the usual telephone vibrating disc set in motion by storage batteries. It gave but little vibration except upon attaching an ordinary piston syringe, and hence it was really suction by hand force. It also had a Politzer bag connected to the same cylinder, which upon pressure forced air into the ear. This machine makes both compression and aspiration; that is all it does, no more.

He also demonstrated an electric vibrating apparatus, which was devised in part by the late Dr. Houghton. This apparatus was capable of producing all types and all degrees of vibration for the ear and was obtainable in the open market.

He did not wish to be understood as advocating massage treatment.

Dr. Phillips also demonstrated the forms of noise produced for use in testing the vestibular function.

DISCUSSION.

Dr. Dench inquired whether Dr. Phillips had ever seen anything but harm come from the use of these noise producers. He has seen much harm result from their use.

Dr. Bryant stated that in one particular he considers the Meyer vibrator better than all other vibrating contrivances; it produces intense sounds having low fundamentals. He has used a machine of this type for over a year and has obtained better results with it than with any other vibrator. He has found it to work well in all forms of chronic sound conduction impairment. The low-pitched sound produced by the machine is of sufficient intensity to cause an appreciable mobilization of rigid parts.

It is possible to carry the use of the vibrator to excess, but the instrument is not, Dr. Bryant thinks, detrimental to hearing, as are many other vibrators. Nothing but advantage is derived from the sound of low pitch. There may be danger in the use of the vibrator in acute cases. Dr. Bryant, however, has never seen any ill effects from the use of the machine.

Dr. Kerrison, referring to Dr. Phillips' remarks in regard to auditory massage, said that he did not see that the various apparatus exhibited were based on any other principle than that which was the basis of all the older instruments which were on the market. Dr. Duel and Dr. Dench and others had reported cases in which deaf patients had used the massicon with consequent very considerable loss of hearing. Dr. Kerrison said that so far as he could see the massicon, which was generally condemned by otologists, and the apparatus exhibited tonight, produced their results in the same way, except in so far as the latter combined a low tone with alternate condensation and rarefaction of air in the auditory meatus. He agreed with Dr. Bryant that the use of the low musical tone might be a useful factor in auditory massage, since the low tone produced the infrequent vibrations which the drum membrane and ossicular chain had in most cases lost the power of responding to. Dr. Preobraschensky, of Moscow, had recently published the results of a rather extensive investigation of the different methods of auditory massage. In summing up his conclusions, he expressed the belief that any apparatus which hermetically closed the auditory meatus and alternately condensed and rarefied the air in the canal, was a crude method which produced such excessive excursions of the drum membrane as could not fail to be injurious.

Dr. Dench said that all forms of suction appartus had been gone over again and again. Delstanche, of Brussells, had taken the Lenval prize for his masseur, which was simply a condensation and rarefaction apparatus, and it is worthless. What Dr. Bryant had said about the use of the low tone was worthy of a trial, though he did not think it would do any good. At the same time, Dr. Bryant claims to have had one positive result, which is worth a thousand negative ones. If a vibration of that character will mobilize the ossicular chain, it certainly would do good, where the lowest tones are cut off. As for the alternate condensation and rarefaction of the air in the canal, that has been proven to be worthless, as have also the ordinary forms of apparatus which produce the "big noise" in the ear. He has seen a great deal of damage result from them.

Dr. Bryant, in reply to an inquiry from Dr. Phillips as to what he called "good results," cited the case of a patient who had defective hearing for thirty years, so that he could not hear the ordinary human voice at a distance of over two inches. After treatment with the machine the patient was able to hear the same voice at a distance of ten feet. That, Dr. Bryant stated, he considers a "good result."

Dr. Phillips said that he had never had any such experience, but he did think there was something in the vibration which gives the patient a sensation of relief. After using it some patients come back and ask for it again, and say that they feel better for it. The owner of this machine claimed that it was the most magnificent placebo he had ever employed. That while some may be made worse by the massage, there are others who claim that the continuous use improves them. There are two sides to the question, as to most others.

Dr. H. B. Brown said that he had examined the apparatus, and had had it applied to his ears by Dr. Cook. He was satisfied that vibration is produced, and felt that much care ought to be exercised by any one who uses the instrument. He believed that the claim made for the apparatus by its inventor was not so much in favor of its producing hearing as in relieving tinnitus, but even after the tinnitus had been partially overcome, it is still necessary for the patient to have an application at least once a month, in order to not relapse into the original condition. In other words, it does not cure.

Dr. Dench said that he had seen instruments upon the acousticon principle used in a number of cases, and in only one case had the patient declared himself benefited. He agreed with Dr. Brown that all forms of noise-producing devices did more harm than good. These devices may relieve tinnitus for the time being, but they do so simply by fatiguing the auditory nerve to such an extent that the subjective noises are temporarily rendered imperceptible. If this fatigue is continued, the function of the nerve gradually becomes impaired, and the patient's hearing will steadily deteriorate.

Dr. Dench had seen numerous bad results from the use of instruments of this character. If any form of apparatus were devised which would give a pure musical tone, of from 16 to 40 double vibrations per second, and this apparatus were used to exercise the auditory apparatus, some advantage might be hoped for in selected cases where the impairment in the hearing depended upon beginning fixation of the ossicular chain. Such apparatus could probably be used without very much risk. At the present time, however, he knew of no apparatus of this character.

Dr. Duel said that the noises produced by the machine were not what might be called musical tones, which would give the vibrations referred to by Dr. Dench.

Dr. Dench said that any sound which is repeated over sixteen times a second is a musical tone.

Dr. Duel said that double vibrations of equal amplitude, either above or below sixteen, would produce a simple musical tone; that when two tones were produced simultaneously they were harmonious if the vibration numbers were the same; that two tones produced consonance if their vibration numbers were in perfect ratio, the simpler the ratio the more perfect the consonance. For instance, the simple ratio of 2:1 or the octave produced perfect consonance; the ratio of 3:2 the consonance of the fifth; 4:3 that of the fourth; 5:3 the major sixth, etc. On the other hand, when two or more tones were produced by vibrations which were not in ratio, dissonance; a disagreeable noise to the ear was evident, and to his mind that was what occurred in this machine.

Paper: A Report of a Few Cases of Otitis Media Suppurativa Treated With Suspensions of Lactic Acid Bacilli.*

By W. H. Haskin, M. D.,

New York.

DISCUSSION.

Dr. Hays said that shortly after Dr. Holbrook Curtis made his report, he obtained a supply of the lactic acid culture from the Lederle laboratory. The culture was put up in two-ounce bottles, much more than could be used at one time. Lately it has been marketed in half ounce phials. Although the lactic acid bacillus is supposed to destroy other organisms in the body, there was no doubt that the culture sent to him did not do so; for in a very short time a scum appeared on the top of the culture. He took some of this solution down to the New York Eye and Ear Infirmary to try it on some cases of chronic ear suppuration. Examination of a smear from the culture a day or so after it had been opened showed the lactic acid bacillus, various other contaminating organisms and a fungus. He believes that the various reports that have been made have been inaccurate, unless the man who has used the culture has used a fresh solution each time. Few men have thermostats in their offices, and therefore the reports have been unsatisfactory. Moreover, it is a question whether the lactic acid bacillus itself or something generated in the culture does the work. This remains to be proved. It becomes a still more complicated problem if good results have been obtained from the contaminated culture. He had made these criticisms to Dr. North, whereupon Dr. North sent him some statistics to prove that he was wrong. After using the cultures of the bacillus bulgaricus on numerous nose, throat and ear cases with no result that could be attributed to the culture itself, he came to the conclusion that whatever advantages are attributed to the lactic acid cultures are due mainly to the especial care that is given to the patient in the way of cleanliness, etc., and if formalin or anything of that sort were used, the results would be equally good. In the form that it is used at present, he is convinced that the lactic acid culture in itself does not have the redeeming qualities claimed for it.

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*See page 49.

Dr. Dwyer said that in their experience they had no trouble whatever from contaminations, as the method of preparing and using the cultures precluded all dangers of these and thus one of the great reasons for failure was excluded. In the early part of the experiments the cultures were supplied almost daily by Schieffelin & Co., and thus the potency and the purity of the cultures were assured. Later on, he made the cultures fresh at the College of Physicians and Surgeons and they were also made fresh daily at the laboratory of the Manhattan Eye and Ear Hospital through the courtesy of the pathologist, Dr. Strong. The directions given to the patients were very explicit and very precise. They came regularly three times a week and were given full instructions that everything was to be sterilized and kept absolutely clean, and the same precautions against contamination were to be taken at home as the nurses took in the clinic. The cultures were always kept on ice. If this is not done, and contamination takes place, the culture rapidly spoils and should not be used. By using these precautions they have had no trouble whatever from contaminations.

Paper: Some Remarks on Sinus Thrombosis With Particular Reference to the Diagnostic Value of Blood Cultures in Otitic Disease.*

By Seymour Oppenheimer, M. D.,

New York.

DISCUSSION.

Dr. Emil Gruening said that he was very much interested in the paper of Dr. Seymour Oppenheimer, who agreed in the main with the essence of the paper read by Dr. Gruening before the society over a year ago. The subject of sinus thrombosis, with particular reference to the diagnostic value of blood cultures, has since that time been repeatedly discussed. So much so that European writers, especially Ruttin, have gathered that in America the clinical symptoms are not used as a guide for diagnosis, but that reliance has been placed chiefly on the blood culture. This is a misapprehension, as is clearly proved in the statement from the paper of Dr. Gruening, who says that in the whole group of the ten cases mentioned the diagnosis of sinus thrombosis was made from the clinical symptoms alone, and that the blood culture was not necessary for the corroboration of the diagnosis. It was nevertheless done by the pathologists in order to become acquainted with the relation that sinus thrombosis bears to systemic infection. In three of the cases mentioned the blood culture was negative. the clinical symptoms, however, were positive, and the operations demonstrated the presence of thrombi. Instructive and helpful as the blood culture may be, we must still rely chiefly upon the clinical symptoms, which are sufficiently well pronounced to determine the proper course of action. This is fortunate as, in the country at large, laboratories are not at the disposal of the clinician.

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*See Page 109.

In the group of symptoms enumerated by Dr. Oppenheimer as characteristic of sinus thrombosis I miss one which is very important, *i. e.*, the septic euphoria in uncomplicated cases. A patient who, in the morning, has had a chill and a temperature of 106, will, after the subsidence of these symptoms, greet the consultant with a smile and a hearty handshake, and tell him that there is really nothing the matter save that he cannot get enough to eat. This optimistic view of his own condition does not occur in any other serious complication of otitic disease.

In the strata of society which furnish patients to the hospital wards, a chronic discharge from the ear is not considered of much significance, and when in the course of this ear disease, high temperature, headaches, chills, vomiting and other distressing symptoms occur, the patient may be considered as a medical case and be admitted to the medical department of the hospital. In the anamnestic data the previously existing ear discharge will be given its proper significance, and the ear may well be suspected as the source of trouble.

Dr. Libman, who is connected with the medical service of the hospital, had the opportunity of recognizing such cases, and of transferring them to the aural service. That the recognition of these cases is not solely dependent on the blood culture, but rather on careful analysis of clinical symptoms, together with the history of the case, is proven by the fact that Dr. Henry W. Berg and Dr. Bernard S. Oppenheimer also referred such cases to the aural department without having made a blood culture.

Dr. Whiting said that he had been greatly entertained by Dr. Oppenheimer. He had laid much importance in the early part of the paper on the fact that the value of the bacteremia was chiefly in those cases that were more or less obscure. As Dr. Gruening had said, many of the cases we see are so plain they do not require the additional evidence of a blood culture to help out. We are oftentimes, however, up against a proposition which is extremely difficult to handle, for the symptoms are not always so plain as Dr. Gruening would have us think. He underestimates the frequency with which we encounter these cases, but we do meet many where the symptoms are not sufficiently definite to warrant us in operating. Dr. Oppenheimer had stated the symptoms in a most careful manner, and has said that we rely largely upon the presence of a bacteremia to determine us in regard to operating when the clinical manifestations are obscure. That has my cordial endorsement.

The value of blood culture can be classified under three headings:

1. Given a suppurating ear, with bacteremia, in the absence of other demonstrable diseases, and I think the assumption that sinus phlebitis exists is warranted.

2. Is there a likelihood that bacteremia, if present, will be demonstrated by blood examination? Dr. Oppenheimer has shown from statistics, and my own experience corroborates them, that in the vast majority of cases it is possible to find a bacteremia—if not at the first examination, then at the second, or perhaps upon subsequent examinations.

3. Does a negative finding prove the absence of a sinus phlebitis? While all agree that it does not, it is very suggestive of the absence of sinus phlebitis, and with the absence of strong corroborative symptoms is sufficient to deter us from operating at once. In any case, where the clinical evidence is in doubt, the presence of a bacteremia must be regarded as strong corroborative evidence.

Dr. E. Libman said: I hardly feel that it is necessary to discuss at any length this evening, because everything that has been so far brought up I have discussed at length in the paper by Dr. Celler and myself and in remarks previously made before this society and the American Otological Society. As far as I could judge from the paper of Dr. Oppenheimer, he lays too much stress on the work of foreign observers. The work which we did was done without knowledge of any foreign work and not done at the request of any clinician. Kobrak did not state that the finding of bacteria in the blood could be used for the diagnosis of sinus thrombosis, because he claimed to have found bacteria in the blood in cases in which he makes no mention of there being present a sinus thrombosis. According to his clinical description, some of these cases may have been cases of sinus thrombosis. Leutert and his assistant, Nuerenberg, were afraid of stating that the finding of streptococci in the peripheral blood was of value in the diagnosis of sinus thrombosis. They feared that streptococci might have come in from another disease focus, such as an angina; that is why they recommended taking cultures from the sinus and from the peripheral blood. The method of Leutert does not appear to me to be a very good one, because it seems that there would be difficulty in getting reliable results when one punctures through an unclean field, as one must do when one punctures a sinus in a case of mastoiditis. To be absolutely sure of one's results, one would have to disinfect the sinus, and any method by means of which one could be sure of obtaining reliable results might cause trouble in the sinus wall. When a patient has double mastoiditis, and there is a suspicion of sinus thrombosis, it might be well worth while trying the method of Leutert, so as to see if one could get a definite clue as to which side to operate upon. We expect to make a study of the value of the method.

In the course of the studies made since the time of our last publication, we have met with no experience that would lead us to change the view-points which Dr. Celler and I expressed in our paper. On one minor point we have a change to make. We stated in our paper that in our experience, as in the experience of most observers, blood cultures are positive in cases of erysipelas only when the latter is fatal to the patient. We have met with one patient recently who had a carcinoma of the breast in whom erysipelas developed after operation. Streptococci were found in this patient's blood and the patient recovered. But in our earlier paper we drew attention to the necessity of looking out for erysipelas as a possible cause of streptococcemia.

As regards the negative blood cultures, there is very little to say, as Dr. Oppenheimer has in his paper given you all the facts Dr. Celler and I established in our paper. It has occurred to me recently that in some of the chronic cases there may be anaerobes in the blood, and as we have used aerobic methods only we may have missed anaerobes. In the course of our last studies, however, we have not had any of the longer standing cases of sinus thrombosis.

We have nothing new to add as regards the disappearance of bacteria from the blood after the jugular vein has been ligated, or in some cases after the sinus was operated upon and the jugular vein was not ligated.

We have studied a number of cases of mastoid disease according to the method suggested by Duel and Wright and have used our own method as a control, but we found no difference in the two methods. We have not been getting positive results in uncomplicated cases of otitis media and uncomplicated cases of mastoid disease. We therefore cannot agree with the findings of Duel and Wright. As stated in a note at the end of our paper which we published last year in the *American Journal of Medical Sciences,* we tested the method of Duel and Wright in a large number of cases of different types of local infection. We picked cases that were very mild, in other words cases that were not likely to be accompanied by a general infection. The diseases of the type which we chose when severe are often accompanied by a general bacterial infection. In all the cases which we had of the mild forms of these infections blood cultures were negative, both according to our method and the method of Duel and Wright.

In the last year Drs. Fried and Sophian, of our laboratory, have made microscopic studies of the blood in a number of cases to see whether we could make the diagnosis more quickly in some of the cases of sinus thrombosis. In one case cocci were found, although the blood culture was negative. This work will have to be continued. One must be very careful in judging results obtained by this method, for even with the most careful technic errors are likely to creep in. However, one essential piece of evidence we did obtain, and that is that in cases of uncomplicated otitis media and mastoid disease we found no bacteria in the blood microscopically, thus confirming the results we have hitherto had in our blood culture studies.

In my opinion it is essential for the otologists to have in connection with their complicated cases not only a bacteriologist but also an internist, because some of the cases are exceedingly difficult to unravel. It is true that in many cases of sinus thrombosis the diagnosis is perfectly clear clinically, but we have seen cases repeatedly in which the diagnosis was decidedly in doubt before the blood culture evidence was obtained, and it even happens that the otologist may be in doubt after he has the sinus exposed. I remember seeing a case in which the sinus was exposed and declared negative by a competent observer. After operation a blood culture was taken which showed streptococci, but the following day when the report was handed in the patient was already in too bad condition for the jugular operation to be attempted. The autopsy showed a fairly extensive thrombosis of the lateral sinus.

I cannot agree with the statement of Dr. Gruening that all the cases of sinus thrombosis are easily diagnosed clinically. In fact the investigations which we have made were started with the study of a case which Dr. Gruening refused to operate upon for supposed mastoiditis and sinus thrombosis, because sufficient clinical evidence was not present. When streptococci were found in the blood and I suggested that as the patient had otitis media and no other primary focus, it might be wise to explore the mastoid process, not only was mastoid disease found but also sinus thrombosis. And I have seen a number of other cases in which the clinician was decidedly helped by bacteriologic investigations. In all the cases of sinus thrombosis in which we have had positive blood cultures there has been evidence of ear disease, but in a number of them there has been nothing to point to mastoid involvement or involvement of the sinus.

So that there should be no doubt as to our opinion regarding bacteremia in local infections, I want to state that we do not say that one does not get general infections in the types of disease which we studied in an attempt to find out whether there are any differences in our method and the method proposed by Duel and Wright. We purposely chose very mild forms of disease, in fact most were ambulant cases. We chose these cases because Drs. Duel and Wright found positive results even in ambulant cases of otitis media.

Dr. Duel said that during the last few years an immense amount of work had been done in the clinical examination of blood. He himself was neither a laboratory man nor a pathologist, and the only ground on which he could venture to discuss these papers must be that he had a little common sense in interpreting evidence as presented by others. These blood examinations had been made not only in the Mount Sinai Hospital but in many other places, and by many investigators; and the combined evidence warranted in his opinion a less positive conclusion regarding the result which had been recorded at Mount Sinai Hospital. Indeed he looked upon the conclusions in the paper as entirely unwarranted in the light of the combined evidence, however much they may have been justified by the obesrvations in that institution alone. For instance, there seemed to be no reason why Dr. Libman, Dr. Celler, or Dr. Oppenheimer should ignore the results of Kobrak, simply because he happened to repeatedly demonstrate bacteremia in mastoiditis, or simple otitis media, without sinus involvement; and there seemed to be no good reason why because a different method had been used than that which had been employed in the Mount Sinai laboratory that they should ignore four similar cases reported by McKernon, the laboratory work having been done by such competent men as Sondern and Brooks, or nine similar cases reported by Wright and himself, the laboratory work having been done by Miss Gimoux at the laboratory of the Manhattan Eye, Ear and Throat Hospital.

He had recently read some voluminous notes by Dr. Guntzer, who had gone over the literature carefully. He hoped that Dr. Guntzer would relate more specifically certain evidences which he could only refer to in a desultory way. It had been established that a bacteremia occurred in practically all infectious diseases, and in all cases in which suppurative foci appeared in any part of the body.

It had by no means been determined that these bacteria never entered the blood current except as the result of a blood clot in the region where the infection took place. In fact it was much more probable that the bacteria began to enter the circulation long before the thrombus formed. It was the usual order that the presence of bacteria in the blood was concomitant with clinical symptoms which manifested their presence, but on the other hand, there were a large number of cases in which bacteremia had been demonstrated without manifestations. He hoped Dr. Guntzer would refer to this point and to Ludke's paper, published in the *Muenchener med. Wochenschrift* about a year ago on the subject of latent microbism. He demonstrated the presence of many different bacteria throughout the different organs of the body and in the blood, lymph channels, etc., in individuals who were apparently perfectly healthy. In some instances this continued for weeks or months. Other observers had also demonstrated similar conditions.

Now, if all this evidence was accepted, it was well that this subject has been brought up again, and that such men as had discussed it should present the other side. He believed that if all concurred with the smug position that septic sinus thrombosis could be so easily demonstrated by the presence of a bacteremia, they might eventually find such a position very untenable in the light of all the evidence.

Dr. Libman had said that if we had demonstrated bacteremia in connection with otitis and without sinus thrombosis, then we had finished with the subject. As a matter of fact we know very little about this question of the blood, much less than we would know a few years hence, and I believe that Libman had punctured his own toy balloon when he made such a statement.

From a practical standpoint, what does it mean to us? It means that we may learn much by careful study of the blood in connection with these septic cases; but we must remember that the subject is not yet finished, and we shall probably have to change our base very much in regard to our conclusions if we go too far on our present knowledge. The fact that there were nine cases reported by Wright and himself and four by McKernon, in which a bacteremia was demonstrated in suppurations of the middle ear and mastoiditis with no untoward symptoms, was very important. When one argued on the one hand that the presence of bacteremia without clinical symptoms in the presence of a suppurating ear, necessitates the ligation or excision of the jugular, or, on the other hand, that the absence of a bacteremia in the presence of clinical symptoms signified that one must wait for another twenty-four or forty-eight hours, or even longer, before operating to demonstrate the bacteremia, it seems like poor judgment.

Dr. McKernon said that he had nothing to add to what had been said, excepting that when Dr. Libman first read his paper he (Dr. McKernon) asked two other pathologists besides those at the Manhattan Eye and Ear Hospital to make a blood culture in cases where the mastoid had been operated upon, in order to determine whether there were any bacteria in the blood. Dr. Wright examined several cases and in six of these—pure mostoid cases—the blood culture was taken the day of the operation, and he reported a bacteremia present. Whether Dr. Wright's method was different from that employed by Dr. Libman, he did not know. In a case where Dr. Sondern made a blood culture there was a mastoid with a high temperature. He reported bacteremia present, and the case was operated upon; it continued to run a high temperature for four or five days, and then followed the usual course of convalescence. In the two cases of Dr. Brooks—simple mastoids also—cultures were taken just prior to operation, and all reported bacteremia, and all the cases went on to perfect convalescence. Dr. McKernon said that he did not know the methods used by Dr. Sondern or Dr. Brooks, or how they differed from those of Dr. Wright and Dr. Libman; he simply had their reports of bacteremia being present.

Dr. Oppenheimer made one statement which should be corrected. He said that in certain cases of sinus thrombosis it is not policy to open and explore the sinus. All of us who have been doing this work come upon some cases after we expose the sinus where it is absolutely impossible to determine whether there is an infection there or not, and you must open it to find out.

Dr. Dench said that the whole matter could be boiled down by saying that if you have a case of suspected sinus thrombosis, and if bacteremia is present, you will probably operate. On the other hand, if you have a case of suspected sinus thrombosis, without bacteremia, you will probably operate also. In other words, while the bacteriologic examination of the blood is of value, it amounts to about the same thing as the differential blood count—that is, it offers strong confirmatory evidence of the condition, but it does not enable one to make a positive diagnosis. The absence of bacteremia is of but little importance if clinical symptoms of sinus thrombosis are present.

Dr. Dench recalled a case seen last spring, in which a patient complaining of severe tinnitus had been subjected to a myringotomy. The drum membrane showed no evidence of any acute inflammatory process within the tympanic cavity. The patient developed a high temperature and a blood culture showed the presence of streptococci in the blood. Another otologist had arranged to operate upon the case at once. Owing to the absence of any acute aural symptoms, Dr. Dench had protested against operation, and the patient recovered, developing later a septic endocarditis, but which evidently did not result from the sinus thrombosis. The aural condition could at no time have been considered the primary focus of infection, as there had never been any acute inflammation of the ear. In this case the bacteremia and imperfect clinical history very nearly subjected the patient to a severe and unnecessary operation.

Dr. Guntzer said that while he had shown Dr. Duel numerous notes he had collected on the subject of bacteremia, they contained very little as to the diagnostic value of blood culture in purulent diseases of the ear. Lüdke's paper made it very plain that there is often a latent bacteremia which would not always give clinical manifestations. Dr. Oppenheimer, in the latter part of his paper, said that from a parietal thrombosis the circulating blood was supplied with microorganisms. That may be true at a late stage, for it seems from investigations that most thrombi are sterile, at least in the beginning, the infection thereof being a secondary process. Luberach examined some 215 vein thrombi in different parts of the body, and out of that number found only twenty thrombi which were infected. The point is that the bacteremia or the infection of the blood probably takes place when the inflammatory process has extended to the vessel wall and caused an injury; the infection of the blood is really secondary to the phlebitis that begins to create the thrombus. Another very interesting point is that the old idea of thrombus formation by the coagulation of fibrin, etc., is changing. Some experiments have shown that the most likely cause of the thrombosis is a slowing of the circulation, and an injury to the vessel wall by an inflammatory process, and that the main constituents of the thrombus are the blood plaques which in all probability are an inherent part of the blood itself.

Dr. Dixon said that as the hour was late he would make his remarks as brief as possible, and confine himself to a report of the work at the New York Eye and Ear Infirmary during the past fourteen months.

During this time we have made 74 blood cultures in 60 cases of suspected sinus thrombosis. Of these 60 cases, 19 were positive, 1 doubtful and 40 negative. Fifteen yielded streptococcus pyogenes, 3 streptococcus capsulatus and 1 pneumococcus. This patient later died of lobar pneumonia and meningitis. (It seems probable that where we have mixed culture in the presence of a meningitis or a sinus thrombosis, if we find pneumococcus, we are liable to have to deal with a case of penumonia. We do not have positive cultures in meningitis alone.) Of the negative cases, there were 4 cases of meningitis, 7 doubtful cases of sinus thrombosis, 3 cases of erysipelas, 2 of perisinus abscess, 2 with symptoms of sinus thrombosis following radical operation, and one each epidural abscess, temporosphenoidal abscess, diphtheria, measles, intermittent fever, suppurative arthritis and pyelitis. In one case of sinus thrombosis, a blood culture was negative before resection of the internal jugular vein, a second was negative four hours after resection and a third was negative three days later; nevertheless the contents of the resected internal jugular vein yielded a culture of streptococcus pyogenes. The 14 comprising the balance of the negative suspicious cases were mastoids.

In two positive cases the blood cultures were found negative within twenty-four hours after operation. Dr. Oppenheimer has spoken of cultures from the canal. We never make them at the infirmary. We do not think it is worth while. We did for a time, some years ago, but found so many germs, and it took so long to separate them that we now simply pick out the predominating organism, which can generally be done at once. It has been the rule to find the predominating organisms in the smears from the external auditory canal, those found in the blood culture, and those found in the contents of the resected internal jugular vein, to be the same. Our experience has shown the relative frequency to run: streptococcus pyogenes, pneumococcus, streptococcus mucosus capsulatus, instead of streptococcus pyogenes, streptococcus mucosus and pneumococcus, but the latter holds good in blood cultures.

Those who have been doing blood culture work have probably experienced some difficulty in keeping the culture tubes at proper temperature. A year ago I devised a water bath (here shown) with twelve tubes, closed at the bottom, which run to within about an inch of the bottom of the bath, the calibre being sufficient to accommodate the usual size culture tube. The case is made of copper, double sides and bottom, with a sheet of quarter-inch asbestos between, to prevent rapid radiation. There is a hole cut in the asbestos at the center of the bottom to facilitate heating. It is supplied with a thermometer and a vent for filling with water, also a handle sufficiently long to swing clear of the thermometer and culture tubes. This is very convenient for carrying around in the wards. We have found by experiment that it will lose one degree centigrade in ten minutes at the ordinary temperature of the room. In the winter time we simply leave it on the radiator, and that will keep it at 50 or 55° C.; when a blood culture is called for we take it off the radiator and allow it to cool down, or put in a little cold water. It cools off very slowly. Since I left the office with it this evening at 7:45 (it is now 11 o'clock) it has gone down to 37° C., and the tubes have just begun to jell. The proper temperature is 40 to 41°. At 41° the ordinary 1½ per cent agar is fluid. It has been very helpful to us, and we would not like to try to get along without it now.

Dr. Hays said that he merely wished to add a report of his blood cultures to those of Dr. Dixon in order to make the work from the New York Eye and Ear Infirmary complete. He started making cultures a year and a half ago, the work being later assumed by Dr. Dixon. He took forty-two blood cultures. In these five were positive, two being taken on the same patient. The method used was the same as at the Mount Sinai Hospital. One positive case contained the staphylococcus aureus and four the streptococcus mucosus capsulatus. There was no case of pneumococcus infection. There were three cases of erysipelas. All of these cases resembled sinus thrombosis, but the surgeons were prevailed upon to wait for the report of the blood culture before operating. All of these cases were transferred to Bellevue Hospital. In six cases an operation was performed for sinus thrombosis before the report of the blood culture. In all of these cases no thrombus was found and the culture was reported negative. There were two cases of acute lobar pneumonia with negative blood cultures. There was one case of cavernous sinus thrombosis in which the culture was negative. The relation of the blood count to sinus thrombosis was rather interesting. The counts were usually low—from 9,000 to 12,000, with a moderate increase in the polynuclears. Whenever a high count was present it indicated some such complication as pneumonia. He had come to the conclusion that blood cultures were mainly valuable when taken with the clinical data and that it is mainly in the borderline cases that cultures are of any value. Negative cultures are of as much value as positive ones. With a clinical picture of sinus thrombosis and a negative culture, it is well to wait, taking other cultures if necessary, provided the case can be closely watched.

Dr. Seymour Oppenheimer said that there were many points he would like to refer to in closing the discussion, but the lateness of the hour demanded his being brief.

Dr. Gruening said that the blood culture was of no very great value in establishing a diagnosis, and that clinicians did not have to depend upon the laboratory for reaching their diagnosis. I agree with him that we should not be absolutely dependent on the laboratory, yet the blood culture as a definite part of the examination is, in my opinion, ofttimes a necessity. In many of the cases I have observed, the blood culture gave the clue to the diagnosis long before the clinical signs were evident, often antedating the latter by two or three days. In one case the laboratory reported five colonies of bacteria present to each cubic centimeter on one day and for five successive days a daily increase in the number, yet there were no clinical signs to warrant interference. My experience with the subject at that time was limited and I would not proceed until the clinical evidences were there.

Dr. Gruening also said he would operate even if the culture were negative. We all would if the clinical signs were present. We ofttimes operate before we receive the report from the laboratory. He refers to the fact that in his series of ten cases he had three negative cultures, yet he operated. These cases were among the earliest of the blood examinations made by Dr. Libman, and the technic was not well developed. Probably now with the method employed all ten cases would have had a positive report.

Dr. Duel said you may get a positive culture in many suppurative processes. I do not know why Drs. Libman and Celler arrive at such different conclusions from Drs. Duel and Wright. I am sorry Dr. Wright is not here tonight to help us solve the matter.

We have operated repeatedly on the sole strength of the blood culture, and have in every instance found a thrombus. When it happens that the laboratory says the culture is positive and the operative findings fails to corroborate the positive report, then I will begin to question its absolute reliability.

Dr. Duel also said a bacteremia may be present in many suppurative diseases. I mentioned in my paper that Drs. Libman and Celler, in order to confirm the Wright method, utilized the Wright method in sixty-six cases of suppurative diseases of a great variety other than otitic, and the results were uniformly negative.

Dr. Dench said that the blood culture diagnosis is simply corroborative, and an additional link in the diagnosis. Quite correct, but it may prove to be the master link, as for example in the case of a young woman admitted to the service at Mount Sinai Hospital on October 22d, the patient being transferred from another institution, with a very mild acute suppurative otitis and the additional diagnosis of a pneumonia. The pneumonia we failed to find, but a blood culture showed a bacteremia. Operation revealed a thrombus in the region of the jugular bulb.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

December 9th, 1910.

A Case of Epilepsy Complicating Mastoiditis.

Dr. H. B. Brown said that he would speak informally of a case seen recently. A little girl, five years of age, was operated upon eight months ago for mastoiditis. The posterior wound healed, but the discharge still continued. Four days ago, when on the street with her nurse, her face suddenly "became red as a lobster," she became rigid and unable to speak or move, and had no feeling, as if she was going to fall. Has had six attacks in the last three days. Has this form of epilepsy, in this case, any relation to the mastoid operation?

Dr. John B. Rae reported in brief a case of

Sinus Thrombosis.

upon which resection of the jugular had been performed that day. The patient was a boy of about 16 years. He was suffering from an acute purulent otitis. There was a small degree of tenderness over the antrum. The appearances within the canal were significant rather of the otitis than of any mastoid involvement. Temperature, however, was 103° F. The patient was admitted to hospital and a paracentesis, a blood count and a blood culture ordered. The count showed a leucocytosis of 23,000 with 72 per cent polymorphonuclears. The blood culture was negative.

On simple mastoid operation the sinus was discovered close to the posterior wall. The inner table over the sinus was eroded for a considerable area, but the vessel itself gave no indication of the nature of its contents.

On another rise of temperature exploration of the sinus was undertaken. Another blood culture had been ordered, but the result not being known the sinus operation was decided upon from the clinical evidence alone.

Later, this second blood culture showed a positive streptococcemia.

This brief report is submitted to emphasize the fact that the blood culture, even in the presence of a septic thrombus, may prove negative and so help to mislead us in those very cases in which the finding of the infecting organism in the blood might be the factor which would determine operation. In the presence of adequate clinical evidence we should not wait for the blood culture; in doubtful cases with little clinical evidence a positive culture should determine operation. Negative culture is not evidence either way.

DISCUSSION.

Dr. Dench said that the discussion of bacteremia was interesting. He had recently performed a radical operation on a boy; four days later a rise of temperature occurred. The blood culture was negative. Forty-eight hours later the blood culture was still negative. The sinus was then exposed and opened by an assistant, and a thrombus removed. The next day the temperature went to 104° and the jugular was resected. After that, only one rise of temperature occurred. The blood culture was positive on the day after the jugular had been resected. He believes that negative blood cultures are of little value; positive blood cultures may be confirmatory, but not positive evidence of sinus thrombosis. As an aid to early diagnosis it cannot be depended upon. We do not need it to make a diagnosis.

Dr. Oppenheimer disagreed with Dr. Dench's last remark, and believes that there are many cases where the clinical evidence is not sufficient without a blood report, and that blood culture is often necessary, and that a bacteremia is often demonstrated before positive clinical signs are present. Some cases of this kind were reported by him at the last meeting of the Section.

Dr. Dench asked if any of the cases were without "temperature."

Dr. Oppenheimer replied that some of them were, and cited two whose temperature had not gone above 100°, in which no clinical evidence of sinus thrombosis was present, the blood culture being the determining factor. In one case 320 colonies of streptococci to each 1 cc. were present.

Paper: A Consideration of the Pathologic Conditions of the Ear Resulting in Profound Impairment of Hearing.*

By E. B. Dench, M. D.,

New York.

Paper: Educating the Eye to Substitute for Deaf Ears.†

By Edward B. Nitchie,

New York.

DISCUSSION.

Prof. John D. Wright (Wright Oral School for the Deaf, New York City) expressed his pleasure at being present at the meeting, and complimented Mr. Nitchie on his paper. He cordially recommended it to the thoughtful consideration of the medical profession. He was especially pleased with the emphasis laid by Mr. Nitchie on the "synthetic" instead of "analytic" method of training; the training in ideas more than in vision. The eyes usually perform their function in the act of lip reading better than the brain, and therefore mental training is even more essential than visual training.

Prof. Wright's principal work during the last twenty-two years has been the teaching of deaf children and young people of school age; teaching them to speak when necessary and to read the lips, and giving them the same education they would have received had their hearing been unimpaired; while Mr. Nitchie has devoted himself to the teaching of lip reading to adults. But, as Mr. Nitchie said in his paper, the two problems touch at many points and involve many of the same difficulties. The speaker said he felt that the gentlemen present wished definite facts that they could take home with them to use for the benefit of their patients when occasion arose. He therefore made four concise statements based on his own observation and experience during almost a quarter of a century.

First. Every adult too deaf to understand ordinary conversation under ordinary conditions can be greatly aided by training in the art of lip reading. Not every artist can be a Michael Angelo, nor every mathematician a Newton, nor every lip reader a Nitchie, but every deaf adult can acquire a degree of proficiency that will be of much service and satisfaction in the social intercourse of daily life. Lip reading has its limitations, but any degree of proficiency is a clear gain and worth time and trouble to acquire. It is well known that the deaf have a tendency to withdraw from social intercourse and become lonely and despondent, and as a result they tend to make less and less use of the impaired faculty of hearing, which neglect in turn produces further impairment of the function. It has been Prof. Wright's observation that the acquisition of any degree of proficiency in lip reading leads to an increase in social intercourse, and owing to the fact that the catching of even detached and imperfect sounds through the ear enormously aids the brain in interpreting the movements of the lips, the lip reader uses to the utmost all his remaining power of sound perception. Unfortunately, most cases of deafness are progressive, and as time goes on the person grows deafer, but it has been Prof. Wright's observation that this progression is delayed by any increased ability to supplement the ear by the eye, owing to the greater amount of use in daily intercourse; for as long as the ear is able to catch any sounds of speech under ordinary conditions it will strain to do so, since it is unquestionably far easier to hear language than to see it on the lips.

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*See page 54.

†See page 74.

Second. Children and young people who have been rendered deaf by illness or accident after some language and speech have been acquired, can, if promptly and properly treated, retain normal speech and continue their social and educational life with very little if any serious interruption. The speaker said he could not lay too much stress on the necessity for prompt action in these cases, for the change of method of perception from ear to eye can be made with much less effort if begun immediately after the impairment of hearing, and every physician knows with what astonishing rapidity speech deteriorates after deafness occurs unless the most prompt measures are taken to retain the normal reflexes. Expert attention should be given this matter even before there has been complete physical recovery from the illness or accident that caused the deafness. The old saying never is more true, "that an ounce of prevention is worth a pound of cure," than in the matter of speech change following impairment of hearing.

Third. Every congenitally totally deaf child, including those rendered deaf in early infancy, can be taught to speak and can be given the same degree of education by purely oral means without the intervention of any manual communication, as the normal child in the same condition of life and of the same degree of mentality; if stupid, in either case the education will be poor. Speech will lack the inflections and varying intonations of the hearing person, but can always be made intelligible to those thrown in frequent contact with the child, and generally to strangers. This training should be begun as early as the fifth year.

Fourth. All children and young people who still retain a little power of sound perception, though not enough to acquire speech and language normally through the ear, can have the brain trained to make use of the remaining imperfect faculty, either for the comprehension of spoken words or for the guidance of their own voices, or for both purposes. The apparent result of this mental training is an improvement in sound perception, but it is difficult to discriminate between an actual improvement in the function of the organ and an improved mental coördination. Even a slight remaining power of sound perception is a very valuable possession for a child, but one that requires much individual training to render it effective. For lack of the necessary teachers to give this individual attention there are hundreds of children in the schools for the deaf with a remnant of hearing that is potentially useful, but is never trained to be of use. The medical profession can exert great influence in all communities to improve these conditions by larger appropriations from the legislatures, and by more effective teaching in the schools. Résumé. It is true that all classes of those suffering from profound impairment of hearing, as defined by Drs. Dench and McKernon, can be greatly aided by proper educational treatment, and they naturally look to the medical profession for suggestion and guidance in the matter. It has been Prof. Wright's experience that very often it is not enough for the physician to give his patient general advice in this matter, or even specific addresses of people to consult, as they often neglect the matter and lose very valuable time. The most certain way of accomplishing what the physician desires is to himself communicate with some capable person and arrange that, by printed matter or by personal letter or interview, the patient be educated to an understanding of the possibilities and necessities of the situation.

Dr. McKernon said that Mr. Wright had covered the ground very thoroughly, but there were one or two points on which he would like to say a word. First: The point mentioned by Mr. Wright, the education of the eye to relieve the mental strain. We are at fault in not advising the taking up of lip reading early. He told of a case that had come under his observation, where a patient fifty years of age, and exhausted by prolonged mental attention, hears better to-day after having been educated by Mr. Nitchie's method of teaching. He gets sounds more easily without the mental effort. In another class, lip reading should not be started early, *i. e.,* cases with slight impairment of hearing, and ashamed of the defect. When hearing for conversation is twelve or fifteen feet, the patient should not be taught lip reading, because the faculty of hearing would be neglected.

In congenital deafmutes, ten years ago the age limit for education was too late. The training should be early; it cannot begin too early.

Dr. Dench said that his paper was simply a résumé of the subject, and by no means exhausted it. In reply to Dr. Whiting, he suggested the possibility of labyrinthine hemorrhage with the parotiditis. By profound deafness he meant when a patient cannot hear a loud whisper at five feet.

Replying to Dr. McKernon, he agreed that cases which hear fairly well but desire education or artificial aid should be discouraged. Lip reading is valuable in cases of excessive mental strain.

He disagreed with Mr. Nitchie and Mr. Wright in their belief that hearing will not deteriorate if neglected for lip reading.

In reply to Dr. Harris he said that changes in the labyrinth are similar to changes in the middle ear; in certain cases diagnosed as otosclerosis that diagnosis cannot be positively made. He recalled a case of apparent otosclerosis, in which the patient now has good hearing after treatment of the middle ear conditions. He believes that attempts at treatment should be made unless the diagnosis of otosclerosis is positive.

Mr. Nitchie, in closing, said that he believes in using the eyes and ears together. Some persons cannot read the lips when they hear the voice; they are confused by the voice. If such persons ordinarily hear the voice in conversation, they should be trained by special exercises to coördinate the two means of perception, eyes and ears, so that the two work together, each helping the other. Dr. Dench urged that the lip reader should be encouraged to use all the hearing he has. Mr. Nitchie said that is not only what he advises his pupils but also what he does himself in his constant practice. Most lip readers naturally use eyes and ears in coöperation; such pupils do not need special practice to develop such power, but they should be urged and advised not only always to use the eyes to help the ears but also to use the ears to help the eyes.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

January 13, 1911.

Case of Gunshot Wound of the Mastoid.

Dr. Seymour Oppenheimer. Case 1.—This patient was admitted to Gouverneur Hospital on the 11th of September, having been shot in the right ear by a 38-calibre bullet passing through the auditory canal and lodging in the mastoid process. There was much swelling over the mastoid region and auricle, but other than deafness there were no other symptoms present. Under local treatment the wound healed promptly and the edema subsided. The deafness, which was almost total by both bone and air conduction, has improved since the time of the injury. The radiograph presented shows the bullet in the posterior part of the mastoid process, and some small fragments around the main mass. There was no urgent reason for subjecting the patient to operation at the time of the injury, nor later, and up to the present time he has been disinclined to submit to operative interference on account of the absence of symptoms. The wound has healed, and the bullet is not palpable beneath the skin.

Case 2.—G. R., age 25. Attempted suicide on May 25th by shooting himself in the head. The bullet entered the right ear. Brought to the hospital by ambulance. General condition on admission, good. Right facial paralysis. Bloody expectoration. Difficulty in swallowing. Serous blood escaping from the ear. Pupillary reaction equal. Swelling along right side of the neck.

Radiograph: Bullet seen in auditory canal, a fragment in the inferior maxilla, and another bullet along lateral pharyngeal wall.

From November 21st to November 29th the patient was in the general surgical service under observation, his general condition remaining good. Some bloody expectoration at times, and some dysphagia. Discharge from ear profuse and of a serous nature. On November 29th the temperature rose to 104, and the patient became stuporous. W. B. C., 21,000; polynuclear, 92%.

On November 30th I was asked to see him. Patient extremely drowsy; large quantities of cerebrospinal fluid escaping from auditory canal, containing pneumococci. Facial paralysis present. Inspection of fundus as well as making of caloric labyrinthine tests prevented by the middle ear space being occupied by the bullet mass. Marked Kernig and Babinski. Reflexes present as well as tache cerebrale, and neck rigidity.

Operation.—The mastoid region was explored and bullet removed from middle ear, it being jammed tightly into the region of the aditus. The facial canal and semicircular canals were splintered, the two ends of the facial nerve being seen. From the semicircular canal a large quantity of cerebrospinal fluid was escaping. Over the cochlea was a large fistulous opening, through which a fragment of the bullet had passed. It is curious to note how this occurred without injuring the underlying carotid vessel. The temporal region was then exposed, and the dura was found to be extremely tense. Incision of same showed a marked congestion of the pia-arachnoid, with some hemorrhage, clots and lymph exudate. Rubber tissue drains were introduced in various directions in the subdural space, completing the operation.

The patient died two days later, with all the signs of an infective meningitis. Repeated lumbar puncture showed the presence of pneumococcus.

The specimen of brain presented showed marked pia-arachnoid congestion over the entire convexity, with areas of plastic exudate.

Gunshot Wound of Mastoid With Brain Abscess.

Dr. Seymour Oppenheimer said that as the patient was in custody he could not be presented. The young man, aged 20, had attempted to shoot a policeman some time in December, but the policeman struck his hand upward, and the revolver went off, the bullet entering his ear at close range. There was much swelling, and powder marks around the auricle, and the patient complained of severe pain in the head and eyes. His mental condition was good. Dr. Oppenheimer said that he did not see the patient until four days after the injury, at which time a radiogram was submitted to him. The eyes had been examined, and there was a double choked disk. Dr. Oppenheimer presented the radiograms, and said that the one presenting a view from before backward, not being stereoscopic, was rather deceptive, as one would judge that the mass was not within the inner table of bone, but between the skin and the external plate. The lateral view showed a large mass situated in the mastoid, and also a smaller fragment lying across the roof of the tympanum. When these plates were submitted to Dr. Oppenheimer the patient's general condition was good, and he showed no signs of meningeal irritation. Dr. Oppenheimer argued that a bullet left in that position would undoubtedly before long give rise to either a meningitis or some sub- or extradural process, and operation was decided upon. The large mass of lead presented was found situated in the mastoid process, and the roof of the tympanum was splintered, and in the roof of the tympanum and amid the area of splintered bone was found the smaller specimen presented, which had perforated the dura. Upon removing this, three drams of foul-smelling pus escaped from the brain substance. The infection was of a saprophytic anerobic nature. The dural opening was enlarged, and a rubber tissue drain was inserted into the brain substance. The patient's recovery was uneventful, and he would have been presented, except for the fact that he was a prisoner. The radiographs were particularly instructive.

DISCUSSION.

Dr. Johnson (referring to the gunshot wounds of the mastoid region) said that the cases were most interesting, and that the amount of cerebrospinal fluid that in such cases sometimes flows from the cerebral cavity is marvelous. He recalled a similar case in which the bullet had lodged in the mastoid region and could not be removed through the canal, although it could be seen. It was necessary to move the ear forward and excise a considerable portion of the bone before the bullet was removed. There was no lead in the cerebral cavity, but there was a fracture, and a tremendous flow of cerebrospinal fluid followed. If the patient's head was turned to one side for a brief space, five or ten minutes, and then turned over, a dram of cerebrospinal fluid would be evacuated. That condition continued for over two weeks, and as the flow gradually ceased the patient became very irritable, and it was feared that he was developing a meningitis; this, however, did not occur, and after a few days of excitement the man made an uneventful recovery.

In another instance a musician fired a twenty-two calibre bullet first into one ear and then into the other, the muzzle of the revolver being pressed into the ear canal, and it was remarkable how the bullets crossed in the cerebral cavity at the base of the brain without severing the arteries. The man had tremendous tonic and clonic spasms, and died in two days, it being impossible to do anything for him. The most remarkable thing was that he could shoot himself in one ear, the bullet passing through the brain, and then place the revolver in the other ear and shoot again. There were no powder marks visible on either side, showing that the pistol muzzle was in each instance pressed into the external auditory canal.

Report of a Case of Otitic Meningitis Presenting Some Unique Symptoms.

DR. SEYMOUR OPPENHEIMER. H. R., age 67, thirty years ago had a chancre, followed by secondary lesions, for which he received appropriate treatment. Has always enjoyed exceptionally good health. In the early part of April the left ear discharged, following an acute rhinitis, for which he consulted his physician, who found the auditory canal much swollen, the tympanic membrane perforated and the middle ear discharging copiously. After three weeks of irrigation treatment the discharge ceased. Shortly after, the patient developed an acute influenza, and the ear again began to discharge. For the subsequent weeks he was not under medical observation, the aural discharge ceasing.

About May 14th he again consulted his physician, complaining of severe frontal and temporal headache. No ear discharge. Temperature, 101.6. Two days later a swelling appeared above and below the ear, and the headache ceased. At this time I was asked to see him by the attending physician, Dr. Eugene Eising. Upon examination I found a marked edematous and infiltrated area about the mastoid region, extending well up over the zygomatic and temporal parts. Considerable infiltration was also present along the neck, with marked lymph nodular swelling. The auditory canal was completely prolapsed, preventing a view of the canal fundus. Hearing for aerial conduction was almost absent. The left ear showed the existence of a marked sclerotic process with a total loss of hearing. The general physical condition of the patient was excellent, no suggestion of meningeal irritation being present. Urinary examination negative. Temperature, 99.2; pulse, 96; respiration, 24.

Diagnosis.—Acute mastoiditis with probable cortical perforation.

Operation May 17th. The usual curvilinear incision through the enormously infiltrated tissues was made, extending from the upper level of the ear to the tip of the mastoid process, one-fourth inch posterior and paralleling the retroauricular fold. A horizontal incision was also made, owing to the width of the mastoid process. The periosteum was well elevated, making a large exposure of the operative field. A perforation of the external cortex was found in the region of the suprameatal triangle, from which large quantities of pus escaped. A probe introduced into this perforation entered a large cavity. With the exception of the marginal edges of the perforation the balance of the cortex was extremely hard. The intercellular osseous walls were much necrosed, and large masses of granulation tissue and swollen pyogenic membrane and free pus were present. The entire cavity was thoroughly curetted, including the zygoma cells, the tip of the process being removed en masse. A very small area of dura was uncovered posterior and above the turn of the sigmoid sinus as well as overlying the anterior bony plate of the sinus, the bony covering in these vicinities being necrotic. The exposed vein wall appeared normal. Unfortunately the specimen of pus submitted to the laboratory for examination was not made.

The patient reacted well from the operation and was apparently in excellent condition.

Thirty-six hours later a chill occurred, lasting for seven minutes. The temperature rose to 106.2, the pulse to 138 and the respiration to 38. He then fell asleep, after speaking to the nurse, and upon his awakening in the morning an aphasia was noticed. An hour later, when I saw him, he was irritable and restless and was unable to speak. Temperature, 105.8; pulse, 140; respiration, 36. The presence of aphasia of course suggested a possible brain abscess, and the marked chill and rapidly following rise in temperature was suspicious of a sinus thrombosis. The mental irritability was not sufficient at that time to warrant the diagnosis of the presence of a meningitis.

The patient was taken to the operating room and the wound inspected, which appeared normal. A blood culture was taken, which was subsequently reported as negative. Lumbar puncture was also performed, and the cerebrospinal fluid was found to contain the streptococcus mucosus capsulatus. The polynuclear percentage was 96. About four drachms of fluid was withdrawn under a normal pressure. It was turbid and of brownish color. Temperature, 102.4; pulse, 140; respiration, 40. The pupils were equal and of normal reaction. The fundi normal, as well as the ocular movements. Left facial innervation slightly stronger than the right. Urine voided involuntarily. Owing to the inability to cause the patient to understand, the mouth and tongue were not examined. The upper extremities move equally well. The deep reflexes present. Both sides of thorax move equally well. Abdominal reflexes very light. Right cremasteric reflex diminished. Motility of both lower extremities normal. Both knee jerks increased. No Babinski, Mendel or Oppenheim signs present. Kernig marked on both sides. Some retraction of the head. Patient speechless and apparently unable to recognize what is being said, although he looks at one in response to speech understandingly, but attempts to elicit understanding of speech, either written or spoken, is futile. When asked if he wants to drink, when shown a glass of water, apparently in sign of recognition he nods his head. No response to noises. No muscular twitchings or tremors. White blood count, 28,800; polynuclear, 94%.

Operation, subdural drainage. Anesthesia, gas oxygen.

With the diagnosis of meningitis, the patient was taken to the operating room, and the upper end of the primary mastoid incision extended upward and forward through the temporal muscle. The underlying squamous plate of the temporal bone was rongeured away, making a large exposure of the dura of the middle cranial fossa. The dura was not bulging appreciably and was pulsating. A large incision was made therein, and but a small amount of cerebrospinal fluid escaped. In making the incision through the dura a branch of the middle meningeal artery was severed, requiring ligating. The pia-arachnoid was much congested, but showed no evidences of exudate.

Three pieces of rubber tissue were introduced in different directions into the subdural space and the wound repacked and the patient returned to bed. A few hours later antistreptococci serum was injected into the cerebrospinal canal. During the day and night all the signs of meningeal irritation markedly increased, and further exploration of the cranial cavity was determined upon. Temperature, 103; pulse, extremely rapid and of poor quality.

Operation.—Conversion of simple mastoid into the radical and drainage of posterior cranial fossa. Gas oxygen anesthesia. With a broad-nosed rongeur the bony wall between the mastoid cavity and the middle ear was rapidly broken away, and the prominence of the facial nerve leveled down to allow of a thorough inspection of the middle ear spaces, the ossicles and membrana tympani being curetted away. No evidences of a fistulous opening, either over the roof of the tegmen tympani or in the region of the cochlea or semicircular canal, could be detected. An area of bone was then removed in front of the descending limb of the sigmoid sinus, between it and the posterior surface of the petrous pyramid. The bony excavation was then carefully continued along the pyramid, until the internal auditory meatus came into view. The dura was incised at this point and a drain of rubber tissue introduced.

The condition of the patient required much stimulation at this time, and an intravenous injection was given.

The operative shock was most pronounced, and death took place three hours later.

The points of extreme interest in the case are:

1. The undoubted existence of areas of cerebellar meningitis, present at the time of the primary mastoid operation, but with no recognizable evidences of the lesion.

2. The development of the aphasia, which is a very unusual symptom, in connection with an uncomplicated meningitis. This latter symptom is due to the fact that the temporal lobe

on the base has no known function, and, according to Starr, if the disease advances upward on the left side, a sensory aphasia may result.

Postmortem Examination.—The portion of the brain which appeared in the wound was dark red in color and hemorrhagic. Extending from and along the convexity from the upper portion of the frontal lobe to the occipital lobe there is a purulent inflammation of the meninges. In the upper portion of the postcentral convolution is a fairly extensive pial hemorrhage about 2 cc. in diameter. Also a productive inflammation of the meninges over the cerebellum (older than the process in pia over cerebrum). No abscess or hemorrhage in interior of cerebrum. Lateral sinus (left) shows a (left) recent non-adherent clot. Over frontal lobe pial vessels much congested and subpial extravasations along their course. Sections from fronto-occipital-temporal lobes show acute exudative meningitis.

Cases of Chronic Suppurative Otitis Media Showing Results of the Yankauer Operation.

Dr. Harold Hays. Case 1. This patient, a young woman, had had a chronic suppuration from the ear since childhood. When admitted to the clinic, there was a profuse discharge of foul mucopurulent material and granulation tissue, which did not yield to treatment. During the summer the Yankauer operation was performed, and two weeks later the discharge ceased. Six weeks later, however, it started again, and the patient was operated upon a second time, in December, with the assistance of Dr. Yankauer, when a number of fistulous tracts were found, and the drum was excised. Some of the adhesions were freed, and since then there has been only a slight discharge of mucoid material.

Case 2. This patient, another young woman, has also had a foul-smelling mucopurulent discharge since childhood. When admitted, granulation tissue was found, with some necrosis of the malleus and the incus. These were removed early in September, and the patient was allowed to wash her ear. The discharge, however, did not cease, and two weeks later the Yankauer operation was performed. After a time the discharge ceased, but later she had a slight return of the discharge. She was then operated upon a second time, but still the discharge did not cease. In December Dr. Yankauer saw her, and some small adhesions were found near the oval window, which was free, and which helped her hearing. The tube was closed, and nothing further was done, and she now has only a few drops of mucus every few hours.

CASE 3. The third patient, a boy, came to the clinic during the summer with a profuse foul-smelling suppuration and three or four large polyps, which were removed in three or four sittings with a snare forceps. The discharge, however, continued, and four weeks later the Eustachian tube was curetted. The discharge continued for a week or two, but was not so foul-smelling or pussy; later it ceased for six weeks, and then again started up. At present there is only a slight thin mucous discharge every few days.

Paper: The Results of the Yankauer Operation in Chronic Suppurative Otitis Media.*

BY HAROLD HAYS, M. D.,

NEW YORK.

DISCUSSION.

DR. BRYANT spoke of Dr. Yankauer's instruments, which had been shown, stating that he considers them excellent and would certainly make use of them if he desired to close the Eustachian tube. Dr. Bryant stated that the paper of Dr. Hays had covered the whole field of chronic middle ear suppuration. But his own remarks would be confined to a few points in regard to the desirability of closing the Eustachian tube.

It is generally recognized that most middle ear and mastoid infection enters through the Eustachian tube. Hence a closure of this channel would be a method of prophylaxis against all such infection. There is, however, one objection to this prophylactic measure—the loss of hearing that it would entail, which is especially significant for those whose hearing is already damaged and who cannot afford to have it still further interfered with. Dr. Bryant's own experiences, without exception, have proved that in the case of middle ear suppuration the hearing of the patient is less if the tube is closed than if it is open. On closure of the tube, either by secretion or other obstruction, there was in many cases a decided loss of hearing; he could recall no case where opening of the tube was not followed by improvement in hearing.

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*See page 86.

The second point discussed was whether it is necessary to undertake this operation of closing the tube in order to avoid a still more dangerous procedure, i. e., the radical operation.

Dr. Bryant stated that he had frequently seen cases of recurrent tympanic infection, due chiefly to the infection reentering the tympanum per tubam. The cure of such cases was always permanent after proper nasopharyngeal treatment. In suppuration of the mastoid cells and antrum it does not seem that closure of the tube would be very effective. Treatment other than the radical measure for these cases can be found in draining the mastoid antrum and cells posteriorly.

With reference to Dr. Hays' statement that 80 per cent of cases can be cured without undertaking the radical operation Dr. Bryant stated that, according to his experience, 100 per cent of noncomplicated cases of chronic tympanic suppuration could be cured without operation and kept so permanently by nasopharyngeal treatment. In the majority of cases Dr. Bryant prefers nasopharyngeal treatment to stoppage of the Eustachian tube. Where the mastoid cells, rather than the tympanic cavity, are involved he advises postaural evacuation of the antrum and cells.

Dr. Oppenheimer said that the whole subject was still so new that every little mite one might add was worth submitting. He had used Dr. Yankauer's method in six cases, or rather in three cases, for in the others he had used the method as part of the radical operation. He had been in the habit of using a little conical burr, which he had picked up in one of the dental supply companies, to curette the Eustachian membrane, in order to get complete closure of the tube. It had occurred to him that Dr. Yankauer's instruments would better conform to the anatomic configuration of the tube and could be introduced deeper, so he employed them in two cases as a part of the radical operation upon the mastoid, and the result was a complete closure, although he and others had also gotten this closure almost always with other instruments. One colleague endeavored to obtain this result with the use of bichlorid 1/500, applied into the Eustachian tube, and had succeeded in closing the tube in that way. There are, therefore, a variety of means at command whereby to obtain this result. In one of the six cases referred to a radical mastoid operation had been performed some three years previously, but the patient returned repeatedly with a small area at the bottom of the wound where some detritus had collected, and when this was removed there was some pus beneath. Dr. Yankauer's curette was passed quite deep into the lumen of the tube and a complete closure resulted. In the other three cases, which came more strictly under the discussion, two had suppuration of a chronic nature in which there was a perforation at the periphery of the drum, strongly suggesting nasopharyngeal disease. It had existed for many years, and sometimes would be dry, and then, following some infection, moisture would reappear. These were distinctly cases of nasopharyngeal infection, and in these two instances he employed Dr. Yankauer's method very effectively. Both cases were seen a week ago, three months after the operation, and they are dry. The third case was one in which there was a large destruction of the drum membrane with some necrosis of the ossicles and granulation tissue. In this instance the method had proved an absolute failure. As Dr. Bryant had said, much depends upon whether the condition is limited to the tympanum and dependent primarily upon some nasopharyngeal infection, or whether it is associated with some more extensive disease in the mastoid process; even in the presence of necrotic areas in the tympanum, where there is no disease in the mastoid, *i. e*, in cases that are dependent primarily on tubal disease, where there is a constant reinfection, on removing the source of infection, although the tympanic lesion may be quite marked, they may clear up by this method which prevents further reinfection. The method is most commendable in properly selected cases, but the type of cases should be carefully selected.

Dr. Rae said that Dr. Yankauer had been kind enough, just after presenting his cases at the section in May, to give him the opportunity to see him operate on two chronic suppurative cases. He immediately provided himself with an outfit and has performed the operation several times since. It is too early yet to speak of the end results of this procedure, but one cannot but be favorably impressed because of the simplicity of the method as compared with the radical operation.

He agreed with the remarks of the previous speakers as to the proper selection of cases.

He had operated on both ears in a case of chronic suppuration in a girl of 16 years. The disease had existed since early childhood and there was no trace of ossicles in either ear. Within three weeks one ear was dry and has since remained so, but the other, though much improved, was still moist. Six weeks after operation the tube on this latter side proved to be closed on inflation. Two weeks later, the ear being still moist, inflation was again practiced and a small amount of air was able to be blown through.

Even when the operation has been carefully performed, it seemed to the speaker that reopening of the tube is possible and that it occurs in one of two ways. The immediate effect of the operation is the formation of a mass of granulation at the isthmus. As cicatrization of this mass proceeds there can be no guarantee, apart from the smallness of the space in which we are working, that the tube will remain occluded when shrinking is complete. The other possibility is that by infection from the nasopharynx the granulation mass may break down entirely. For these reasons it would seem wise to inflate, after a reasonable time, not only those cases which have failed to clear up but also the cases which have apparently cured.

Dr. Rae also said that, like Dr. Oppenheimer, he had used the Yankauer instrument to close the tube in the performance of the radical operation.

In reply to a question, Dr. Rae stated that there was no difference in the hearing in any of his cases. So far, however, he had only operated on cases of very long standing with considerable impairment of hearing. It should not be forgotten in this connection that practically all intermittent discharging cases hear a little better when the ear is moist than when it is cicatrized and dry.

Dr. Yankauer said that he had been very much interested in Dr. Hays' paper and in the questions which had been brought up. In his original paper it should be noted that the cases which got well quickest were those in which the middle ear was clear, and the cases which required the longest time were those where there was granulation tissue or cicatricial adhesions. That fact is quite in accord with the pathology of middle ear suppuration. The primary cause of all middle ear suppurations is a nasopharyngeal infection; the closing of the Eustachian tube will put an end to the infection from the nasopharynx, and the healing of the diseased process in the middle ear will depend entirely on the degree of disease present in the middle ear and mastoid cells. When the disease is slight and there is little or no bone disease and no exuberant granulations, there will result a rapid cessation of the discharge; some cases would no doubt be helped by intratympanic operations. In all cases, closure of the tube is necessary, whether done at the time of the radical operation or otherwise. The removal of adhesions of the drum membrane to the inner tympanic wall, of cicatricial bands, of disease in the attic, etc., which can be reached through the canal, will help in establishing a cure. On the other hand, in cases of profound disease in the mastoid cells it is hardly to be expected that a cure will be effected. Whatever cure is effected will have to be done by nature, for all that the surgeon can do is to keep the region clean and remove the products which interfere with drainage. Cases in which such conditions were present required considerable time before becoming dry. He did not consider six weeks sufficient time to establish a cure: some cases do not get well for a year and a half. One of his cases had continued to discharge for over two years; then the patient came under the care of a colleague, who did nothing for the ear, but who reports that it has now become entirely dry. So a cure is possible even after two years. Whether or not it is wise or justifiable to wait so long before doing the radical operation is a matter of opinion and individual judgment.

Dr. Bryant's argument interested him very much. In his observation, when the tubal orifice is filled with secretion the hearing is lost. That observation, which is entirely correct, does not apply to the case at issue, for when the tubal orifice is filled with secretion, it can be assumed that the lower portion of the tympanic cavity is also filled with secretion, and in all probability the notch of the oval window is not free to receive the sound waves; whereas when the Eustachian tube is closed at the isthmus and the ear is dry, the sound waves can be reflected into the round window. In a number of his own cases, and in one of Dr. Hays', there was improvement in the hearing following the severing of adhesions which had obstructed the entrance of the sound waves to the round window. The condition is different from that presented when the ear is filled in its lower part with secretions. There has not been any diminution in hearing in any of his own cases; there has been no effect, one way or another, on any tinnitus which was present; it was not made better or worse in any of them, and no tinnitus appeared which had not existed before.

Another question is the selection of the cases in which this operation should be done. It is very difficult to decide that question at the present time. According to the usually accepted indications, whenever there is cholesteatoma there should be a radical operation, yet he has seen two cases get well by simply curetting the tube and waiting. Some operators would consider radical operation in the case of polyp formation; in cases in which polyps were present, he had removed as little of the polyp as he could in order to get at the region of the tube, and treated the remaining portion with applications of nitrate of silver; in several rather large polyps treated in this way he has seen them gradually get smaller and smaller, and finally disappear. At the present time it is not possible to decide which cases will get well by simply closing the tube and which will not; but it is conceded that even if the radical operation is done the tube must be closed, and if that is the case, nothing is lost by closing the tube first and waiting results; on the other hand, a good deal would be gained if the tube has been closed; for if it is already closed when the radical operation is performed we can expect a clean wound and better results. The question is: How long should we wait after the tube has been satisfactorily closed before we decide to do the radical operation?

Dr. Oppenheimer inquired if any of the members knew of any case where the carotid artery had been injured by Eustachian tube curetting. Every article on the subject of the radical mastoid which he had read advises extreme caution on account of the proximity of the carotid artery, and the presence of a possible dehiscence, yet he knew of no instance where any such injury took place from Eustachian instrumentation.

Dr. Oppenheimer said he understood that the case to which Dr. Whiting referred to was one where the chisel was driven into the carotid artery, and was not due to any manipulation in the Eustachian tube.

THE CHAIRMAN announced the presence of a guest whose name was familiar to all who attend the national meetings, and was also well known as the inventor of several useful instruments which most have found useful and necessary in operative procedures—Dr. Allport of Chicago, and invited him to take part in the discussion.

DR. ALLPORT said that he had not intended to take any part in the discussion, but could not refuse to say a few words in regard to Dr. Hays' interesting paper on Dr. Yankauer's operation. No one ought to discuss a subject unless he is familiar with it, and he was not at all familiar personally with the Yankauer operation, though he has great respect for Dr. Yankauer's judgment and ability and had seen the operation performed several times during his visit to New York in the last few weeks. He intended to try it when he got home, for one ought to try whatever holds out any promise of mitigating human suffering. Of course the operation will have to stand the test of time, like everything else, but it is a laudable effort to avoid doing the radical mastoid operation, and no one wishes to perform that operation if it can be avoided, because of the loss of time to the patient, the possibility of accidents, such as facial paralysis, or the possibility that after all the case will not be healed. It is true that such accidents are diminishing very much indeed as time progresses and the technic is improved. Almost all cases do well now.

Of course there are a number of procedures which have been promulgated for avoiding the radical operation. The so-called Heath operation, devised by Dr. Heath of London, evoked considerable enthusiasm at one time, and yet that has quieted down and few surgeons use it at the present time, though it may be useful under certain circumstances. Dr. Yankauer's operation seems to be the same sort of procedure, and we have to learn where it belongs. It is a useful operation and has doubtless come to stay for certain cases, but these cases will have to be carefully selected, for unless the cases are suitable the operation will be futile and will be discredited. The cases which the operation will help are mainly those of tubal disease. Dr. Allport said that he had very little confidence that the operation would do good in cases of general middle-ear necrosis, or in cases of attic necrosis or antrum necrosis; it is not going to be a cure-all; but where disease gets in the cellar of the middle ear and comes from a tubal disease that secondarily produces certain lowered tympanic pathologic conditions, we may look for good results from it.

The question comes up, whether, even in a large proportion of these cases, good results will not be obtained by proper treatment of the nasopharyngeal space. The probability of injuring the carotid artery by this operation seems rather far-fetched. The instruments are well devised and prepared, are not vicious or harmful, and if used by one who has the delicacy of touch that he ought to have in any work of this kind the danger of injuring the carotid is remote; one can tell immediately by the sense of touch that he is on dangerous ground.

One use for the operation had not been mentioned this evening, but seems one which may prove of considerable utility in time—that is, in cases of uncured radical operation, where the discharge continues after the operation. In all such cases as he has seen, the disease has come from the tube; the other part is all right. When he does the radical operation he endeavors to not only curette the tube, scrape off the mucous membrane, but to absolutely scrape off the bone, so as to secure an absolute adhesive inflammation and close up the tympanic orifice of the Eustachian tube—he scrapes off the mucous membrane and bone as far as the isthmus. It seems probable that Dr. Yankauer's operation will prove very useful in these cases, and may be the finishing touch that is needed to cure the last pathologic condition.

One of the speakers had made a statement which he wished to challenge, when he spoke of the frequent occasions when the radical mastoid operation was performed and found to be unwarranted by the pathologic conditions. He has not seen many such cases in this country, though he has seen some in Europe, where he could not tell what they were operating for. In the cases he has seen in his own practice and in New York City, he has practically never seen an instance where the mastoid bone has been exposed that abundant evidence has not been found for the operation, and where nothing else would have been effective. The Heath operation leaves untouched the attic, the very region that needs attention, and which after all is the center of the disease. He wished to emphasize the fact that almost all the cases in this country that are operated upon by conscientious surgeons, have first been submitted to proper treatment which has proved ineffective before the radical operation is resorted to.

Dr. Hays, in closing the discussion, said that in most of his cases he thought there was no appreciable difference in the hearing before and after the operation. They heard nothing before, and heard nothing after. In the fourth case the freeing of the adhesions allowed the girl to hear better. All would agree with Dr. Bryant that the nasopharyngeal conditions have much to do with the condition in the middle ear, and in those cases where there is not much necrosis or granulation tissue in the middle ear we ought to expect an excellent result from the operation. The argument has been brought forward many times that most of the cases that we do not operate radically would be cured if proper care were taken of the middle ear. He then cited a case in private practice where a patient had suffered from chronic discharge for years. This patient had been treated at various times for from six to eight weeks to three or four months, and the discharge decreased slightly; by that time the patient thought that he had done all that he could afford for the time and stayed away, and the discharge again increased. It is in such cases that will not submit to the radical operation, and where the discharge continues from year to year, that the Yankauer operation offers a chance of cure.

In the case of the failure reported by Dr. Oppenheimer, Dr. Hays said that he thought if the tube were inflated and found to be open at the end of six weeks, it might justly be thought there was some fault in the technic at the time of operation. He has tried to inflate cases and found he could get nothing through them; later he got some air through, but still later nothing at all. In considering these cases with some other men, they came to the conclusion that the reason it stopped for a few weeks was that the tube was actually closed with an acute inflammatory process which gradually subsided and the tube again opened. It might be such a minute perforation, that simply passing the Eustachian catheter and blowing some air through, bubbles would come out in water which had been placed in the canal, and even such a small opening would keep up the discharge.

In regard to the cases in children which Dr. Page had spoken of, it would not seem wise to submit children to such treatment until the chronic nasopharyngitis, etc., had been treated by simple measures. The only thing he would claim for Dr. Yankauer's operation was that cases which had continued for many years were relieved by it. Children ought to have every chance given before resorting to this or more serious measures. In all probability it was not possible to attend to the ears as in an adult after the operation had been performed. The operation was not offered as a cure-all. In many cases where the radical operation ought to be performed, we are in an unenviable position when the patient returns and claims that he has been treated for some time and can get no promise of improvement, and yet will not submit to the radical operation; in such cases, even where it is suspected that the trouble may be in the mastoid, it is only fair to try the closure of the Eustachian tube.

There are really two classes of cases in which the operation is of great value; the first, where patients have suppuration from the middle ear on account of nasopharyngeal discharge coming through the ear and reinfecting it every time the nose is blown. In these cases the closing of the tube is the best thing possible to check the condition which would otherwise probably go on to radical operation. Then there are cases where for one reason or another the radical operation ought not to be done. Dr. Yankauer had reported two cases with pathologic conditions in the middle ear which got well after clearing up the conditions and closing the tube. That negatives the idea that closing the tube does not effect a cure.

In regard to performing the radical operation where the mastoid is not involved, we are liable to find some trouble in the attic, and then it is possible to get into the attic and clean it out pretty well, by way of the external canal, provided there is a perforation in the drum membrane. When we begin to clean out the mastoid we might find some eburnated bone which is very hard; we dig until we come to a very small attic which communicates with the middle ear cavity as well as with the mastoid itself. It is in that class of cases that if we clean out the middle ear and attic and close the Eustachian tube we are liable to get good results.

The question could be argued indefinitely, but the point he wished to emphasize in his paper was that in this method we have a new procedure which should receive a fair trial; in the hands of those who have tried it, it has given excellent results, and where there has been failure it could often be accounted for by failure in technic, or in some lesion that had not received proper attention. It was with the hope of encouraging those to try it who have not yet attempted it, that he has presented the facts given in his paper.

NEW YORK OTOLOGICAL SOCIETY.

Stated Meeting, November 22, 1910.

DR. JAMES F. MCKERNON IN THE CHAIR.

PRESENTATION OF PATIENTS

Mastoid Operation for Persistent Pain in Mastoid Region.

DR. THOMAS J. HARRIS presented a patient whose history had been detailed by him at the last meeting of the society. The patient, a young woman, was under his care at that time for persistent mastoid pain and tenderness, for which an exploratory operation was proposed. The case evoked considerable discussion by the members of the socicety, and a further report was promised. The history was briefly repeated.

The patient, perfectly well in other respects, was seized last winter with very severe pain in both mastoids, the pain not being confined to the mastoid regions, but proceeding down behind the ear and up into the head. The ear presented nothing abnormal. The drum membranes were normal, there was no sagging of the canal and there was no temperature. The case presented every feature of one the symptoms of which would subside very promptly. The patient was put upon anti-rheumatic and constitutional treatment, and all the remedies known to the speaker for such cases. The symptoms increased in severity very gradually, and shortly after the May meeting of the society the patient was sent to the hospital. She was generally prostrated at the time, was unable to sleep and had the same pain behind the ears, extending into the canal, over the side of the head and into the occiput. An exploratory operation was advised, and the last of May or first of June the mastoid of one side was opened by the classical Schwartze operation. A considerable number of large pneumatic cells were found. These cells, unlike those of a case reported at the last meeting by Dr. Berens, were not filled with osteophytic deposits. The mastoid was thoroughly cleared out and the wound closed with the exception of a small drainage point at the lower part. This healed without discharge in ten days. The symptoms entirely disappeared except a little stiffness in the neck. There was more pain on the other side, and the patient insisted upon having the left mastoid opened. At the end of ten days this was done, whereupon almost the identical picture was found upon the left as had been previously found upon the right side. She was discharged in about ten days. Since that time there has been no pain whatever on either side until this fall, when she returned complaining of some pain in the mastoid region, or rather just above the mastoid. This disappeared entirely under constitutional treatment. The pain was not nearly so severe as that experienced before operation.

The case was an excellent one for primary closure of the wound. A large amount of bone was removed, and only the primary dressing was employed.

There was at no time any alteration in the hearing. The speaker felt fairly sure at the time of operation that he was dealing with a neurotic individual, and that virtually nothing would be found in the mastoid, but he felt justified in performing an exploratory operation. In looking over the literature of these cases he found the immediate results such as he had obtained, and that later on there was a recurrence of pain in some cases.

Dr. Gruening said the classical Schwartze operation consisted in the opening of the antrum. Dr. Harris had done more than that. The speaker called attention to a series of forty or fifty cases from Mount Sinai Hospital published in 1891, which had been very severely criticized in the *Archiv für Ohrenheilkunde,* the statement being made that the whole cortex should not have been removed. It would have been a mistake in the case presented not to have closed the wound. Dr. Harris did not present the case as a paradigm of those reported by Dr. Blake, who closes his infective cases. Dr. H. Knapp had published some cases in which the bone was a hard, solid mass, with no cells. He finally entered the antrum, which was small. Recovery followed the operation.

Dr. Harris, in closing the discussion, accepted Dr. Gruening's suggestion that the operation performed in the case reported was not the classical Schwartze, as he had unwittingly said, but the more extensive operation to which Dr. Gruening referred as having been performed in the series of cases mentioned.

Replying to Dr. Whiting's remarks, the speaker said operation was undertaken in this case with the greatest reluctance, and only after several weeks of treatment. Aspirin intensified the symptoms. The patient's physician saw her becoming a nervous wreck, with pain so intense that morphin was the only thing that would give relief, and operation was undertaken only as a last resort. From the standpoint that one does not know what is in a mastoid until one has looked into it, and that the operation, properly performed, is not a dangerous one, he would certainly proceed in a similar case just as he had in this one.

Result of Plastic Operation.

Dr. John B. Rae presented a patient to show the result of a plastic operation. The patient is a girl of 10 years, who six years ago underwent a simple mastoid operation on the right side. The postauricular wound did not close and has remained open in spite of two subsequent operations described by the parents as "scraping the bone."

When seen by the writer the patient exhibited a deep sinus behind the right ear. This was large enough to admit the tip of a finger, had no apparent communication with the aditus and was dermatized and dry. The opening evidently corresponded to the enlarged antrum, and examination of the roof of the cavity revealed the fact that the tegmen was completely gone and that the space was roofed in by exposed dura. The middle ear was dry and the hearing good.

Operation.—An incision was made from above to the edge of the middle point of the cavity, was then carried posteriorly around the margin of the opening to the middle line below and from there was carried directly downwards. The isolation of the cavity was completed by joining the two vertical incisions by rimming the opening anteriorly. The edges of the flaps were raised quite freely. The lining of the cavity itself was then very readily dissected out, coming away like the blind end of a glove finger and carrying with it an epithelial layer from the exposed dura.

The bone cavity showed a small black area posteriorly and the whole exposed bone was freshened with a curette, no attempt, however, being made to establish communication with the middle ear. The whole field was then carefully cleansed and the cavity allowed to fill with blood from the margins of the flap. When coagulation was complete, the wound was sutured from end to end and a dressing applied. The wound was inspected from day to day and healed by first intention. The sutures and dressings were removed within a week and the result is apparently as good as it can be.

Three months later there is a very slight depression in the scar corresponding to the former cavity.

DISCUSSION.

Dr. Gruening asked whether, with the dura exposed and the cavity dry, it was absolutely necessary to scrape the dura and the cavity, and whether it would not have been possible to get a good result without the blood clot. He had obtained primary union without scraping the bone. The dura was not exposed in his cases.

Dr. Dench suggested an osteoplastic operation for the relief of these very depressed cavities. The soft parts are dissected out, and, with a small chisel, a quadrilateral flap of bone is taken from the mastoid opening, being divided above and below and left hinged in front.

Encephalitis Following Middle Ear Abscess.

Dr. H. A. Alderton presented a patient whose history was reported at a previous meeting of the society. The patient, a boy 8 years of age, had been referred to him by Dr. Margulies of Brooklyn. One month previously an abscess had developed in the left ear, and since that time the boy had earache once or twice weekly. There was no discharge. The posterior superior wall of the canal was sagging; there was no pus in the canal; the drum membrane was congested and thickened; there was tenderness over three points of the mastoid, viz., the antrum, tip and posterior border; the temperature was 99 1/10, the pulse 94. The drum membrane was incised and irrigation and purgation ordered. The local condition did not improve, and four days later the usual mastoid operation was performed. The bone was found to be full of cells containing pus and granulation tissue, especially the vertical cells under the mastoid antrum. The patient did well for two weeks, though he ran a temperature of between normal and 100° and at times complained of some headache. On the 30th of March he was suddenly taken with convulsive seizures involving the left side of the body and the jaw, nystagmus, horizontal and to the left, apparent paralysis of the right side of the body, and complete unconsciousness. The temperature was 100 2/5°, pulse 100 and respiration 26. This condition followed an attack of severe headache, and lasted from 12:45 p. m. to 2:30 p. m., when he was taken to the operating room.

At the second operation the dura was exposed over the mastoid antrum superiorly and over the sinus and cerebellum posteriorly. The dura was merely congested. After recovery from the anesthetic the convulsions and paralysis disappeared and the patient was in much better condition, though still complaining of headache. The temperature was 100 4/10°, pulse 84 and respiration 24. The headache, with restlessness, continued to manifest itself during the following days. On April 5th the patient complained of nausea, but did not vomit; on the 11th he was drowsy and heavy all the afternoon; on the 14th he was nauseated and vomited. On the 15th the temperature became subnormal—97°—pulse 50-60, respiration 26. There was suppression of urine for twelve hours, and constipation. About 4:30 a. m. he had a severe spasm and was unconscious for about half an hour. Upon recovery of consciousness the pain in the head was just as severe as before. Involuntary urination, another period of unconsciousness, and a continuation of subnormal temperature and pulse marked the next few days. On the 20th the patient became conscious and more comfortable, complained of hunger on the 21st and 22d, and had good nights. Pulse and temperature returned to normal, and from this time on he progressed to apparent complete recovery.

Blood examinations at the time of the first operation showed polynuclears, 78%; leucocytes, 15,187; hemoglobin, 83%. March 31st, polynuclears, 81%; leucocytes, 18,382; hemoglobin, 79%.

Urinalysis, March 15th, showed specific gravity, 1028; trace of albumin; indican very excessive; occasional casts.

Remarks of the pathologist: "Marked intestinal fermentation and mild parenchymatous irritation." On March 31st the specific gravity was 1012; no albumin present. Remarks: "Aside from the low urea percentage and specific gravity sample is practically normal."

Report of oculist, April 15th, was as follows: Oculomotor muscles normal in action; pupils respond normally. Right eye: Retinal veins rather too full and slight tortuosity of some of the arteries. Nothing significant. Left eye: A suggestion of optic neuritis; a beginning optic neuritis.

The patient was seen by a neurologist on April 15th and the diagnosis made by him was brain abscess, not localizable. Operation was recommended and refused.

From that time on the patient's condition improved, no further symptoms having appeared. He has had some trouble with his eyes, but he has improved in every way. The wound is more disfiguring than usual because it was kept open on account of the exposed dura. A wet bichlorid dressing was employed.

DISCUSSION.

Dr. Dench asked to what Dr. Alderton attributed the improvement, and whether he considered the condition one of serous meningitis. He cited a case which came under his care two years ago. The child was *in extremis* when first seen by him, and he refused to operate. The meningeal symptoms continued, the patient became blind and deaf. The Babinski sign was present at the time. He operated five weeks later, exposing a considerable area of the dura over the temporosphenoidal lobe and cerebellum. The temperature fell the next day and the child made a complete recovery of sight and hearing.,

One ordinarily supposes that exposure of the dura does not decompress the brain, but he was inclined to think that if the decompression operation were done more frequently there would be a larger proportion of successes in these cases.

The speaker agreed with Dr. Rae that removal of the bone may compensate for the pressure.

Dr. Rae suggested the possibility of there still being a latent abscess present in this case.

Dr. Alderton, in closing the discussion, said he was inclined to think the condition one of encephalitis. If it had been serous meningitis, as suggested by Dr. Dench, there would have been more tension than existed in this case.

Replying to a question by Dr. Gruening as to whether the bone was diseased, the speaker said the bone over the temporosphenoidal lobe was affected.

In response to a question by Dr. Harris concerning lumbar puncture, Dr. Alderton said none was made. He had operated as a last resort, and it was after this that the subnormal temperature and pulse developed. The patient was then seen by the neurologist, who made the diagnosis of brain abscess, and further operation was refused.

The nystagmus was horizontal toward the side affected. He had not examined the patient as to high tones, as suggested by Dr. Whiting.

Typhoid or Malarial Fever Mistaken for Mastoid Abscess.

Dr. William Cowen gave the history of a girl, 12 years of age, who had spent all but the last six months of her life in Arabia, and who, when he first saw her, was suffering from acute otitis media. Her temperature was 104°, there was no mastoid tenderness or bulging. He was called in consultation on account of the temperature. He decided to wait. The next morning the temperature dropped to 102°, running up again to 104° in the afternoon. He then decided to operate. He removed the cortex, and explored the tip, but found nothing. Two days later the temperature rose again, and for two weeks it had been fluctuating between 102° and 104°. The case was then gone over medically, and the spleen was found to be excessively large, extending below the free border of the ribs. The condition was supposed to be either typhoid fever or malaria, but there could be got no evidence of the plasmodium, and the Widal test was negative. No blood culture was made. The temperature evidently had nothing to do with the mastoid, and the case illustrated the importance of not being hurried into surgery until the symptoms are more compelling. He had never seen a spleen of that size in a septic case.

Temporosphenoidal Abscess Complicating a Chronic Purulent Otitis Media, With a Septic Temperature Range as the Only Symptom of a Diseased State.

Dr. Robert Lewis, Jr. Mary McN., æt. 8 years, was admitted to my service in the New York Eye and Ear Infirmary on December 25th, 1909. The aural history of her case was as follows: There was an acute purulent inflammation of the right middle ear, complicating scarlet fever two years ago. A polypus was removed from the middle ear in March, 1909; this was followed by a cessation of the discharge for a time. The otorrhea reappeared in September and lasted until ten days previous to her admission to the infirmary, when it suddenly ceased. One week previous to her admission to the infirmary the patient complained of a severe pain in the ear, accompanied by headache. This continued up to the date of her admission into the hospital.

Examination of the patient on admission showed a normal condition of the heart, lungs and kidneys. The temperature was 102° F., the pulse was 108, the respiration was 26.

The external auditory canal was so stenosed as to prevent a view of the drum membrane. Evidences of a subperiosteal abscess were present and tenderness over the mastoid process was very acute.

Operation.—The subperiosteal abscess was evacuated, and a small cortical perforation was found in the mastoid process. The antrum was filled with a cholesteatomatous mass. The radical mastoid operation was performed. Following the operation the temperature was below 101.2° F. for the next eight days; on the tenth day it rose to 102.4° F. and on the twelfth day it rose to 105.2° F. During the next nine days rose on four occasions to between 104° and 105.2° F.

The morning of the twenty-second day after the operation it fell to normal and remained below 99° F. until 8 p. m. of the twenty-fourth day, when it began to rise and reached 105.2° F. at 4 a. m. of the twenty-fifth day. The rise of temperature was preceded by a chill.

During this time she was seen by Dr. Walter B. James and Dr. Walter Lester Carr, the consulting physicians of the infirmary. They could find no lesion to account for her variable temperature.

The patient had no headache, no drowsiness, no stupor; on the contrary was very bright, even when awakened from a sound sleep. The eye grounds were normal, and the reflexes were normal. Widal test was negative. No tubercle bacilli were found in the stools. Smears from the aural discharge showed a mixed infection. January 15th the blood culture was negative.

Blood Count.	Jan. 5th.	8th.	12th.	17th.
Red B. C.	4,800,000	4,800,000	4,000,000	4.020,000
White B. C.	25,200	7,400	16,000	8,200
Small Mononuclear	7.5	16.	9.4	35.2
Large Mononuclear	2.5	6.	2.6	7.6
Transitional	0.	1.8	1.0	.6
Polynuclear	89.5	75.8	87.	56.
Eosinophile	0.	.2	0.	.6
Mast cells	.5	.2	0.	0.

On only two occasions was the pulse slower than seemed compatible with the temperature curve.

On January 18th she complained of slight headache. She was weak and emaciated. There was no symptom of a definite lesion in any organ, nor of a general dyscrasia. Except for the temperature the girl would have been sent home. The wound had done well with the exception of a small area in the upper posterior portion of the excavated mastoid cells. This area was about the size of the diameter of an ordinary lead pencil and would not cover over with granulations and looked dark. I determined to explore this point, so on January 18th I reopened the wound and explored the bone in the vicinity of this dark area. As I went further into the bone the dark area increased in size, and as I entered the middle fossa there was a gush of pus. The opening in the bone was enlarged and about three ounces of foul pus was evacuated. The abscess cavity extended fully two inches into the brain substance, measuring from the dura upward, inward and backward. The cavity had well-defined walls. It had ruptured through the dura mater, but a plastic lymph around the opening confined it to a limited area.

Following the operation the temperature never rose above 100° F. except on February 6th, when it rose to 103° F. for a short time.

I believe the abscess which was found had been present for some time and that the radical operation had kindled into action a latent process. Of course the fact that the abscess had well defined walls made the chances of recovery infinitely better.

I used a rubber drain for 24 or 48 hours and after that depended entirely upon a gauze drain.

The patient made a rapid recovery.

Late Mastoiditis Following Scarlet Fever With Perisinus Abscess and Sinus Thrombosis.

Dr. H. A. Alderton presented the history of a girl, 6 years of age, who had been ill for forty-nine days following the inception of an attack of scarlet fever. She was admitted to the Kingston Avenue Hospital on November 1, 1910. Her general condition was then very poor, she was markedly emaciated and poorly nourished. The body and soles of the feet showed a scarlatiniform desquamation. There was a patch of unorganized membrane on the left tonsil, no discharge from the nose and no conjunctivitis. The left ear was normal; from the right ear there was a profuse bloody discharge; the drum membrane was almost entirely gone; the manubrium was present. The soft tissues of the right mastoid were swollen, reddened and tender, with projection outwards of the auricle. The heart sounds were muffled; the first sound was not of good muscular quality; the second pulmonic and aortic sounds were slightly accentuated; the rate was irregular There was no appreciable enlargement of the heart. The percussion note of the lungs was normal; breath sounds normal; no rales heard. Abdomen and extremities normal. Glands of the neck were palpable. The pulse was irregular and of poor tension. Urine negative; throat culture negative. For two days following admission her temperature ran from 99 4/5° to 100 2/5°; pulse 104 to 124; respirations 26 to 28.

Operation upon the right mastoid, November 3, 1910, showed the bone to be in a condition of dry necrosis from tip to antrum, except for an area posteriorly directly over the sigmoid sinus, where the cells were broken down and the cavity formed contained thick offensive pus which pulsated. Exposure of the sigmoid sinus, by following up the pus tract, disclosed a perisinus abscess lying far down toward the bulb of the jugular; pus was also escaping from a perforation in the outer wall of the sigmoid sinus just above where it begins to turn inward and downward to reach the bulb. Enlargement of the opening in the sinus wall, and careful probing of the caliber, showed either an organized thrombotic occlusion above or an agglutination of the sinus walls, or both; below the sound failed to reach the bottom of the abscess cavity within the sinus. Because of the poor general condition of the patient, ligation of the jugular was not attempted, especially in view of the apparently walled-off character of the sinus abscess and the absence of clinical signs of systemic infection.

The condition of the patient had steadily improved since the operation, and the mastoid wound was healthily granulating except for a small area of exposed bone within the antrum. This would probably need curettage to living tissue.

The only reason for reporting the case was as an example of late mastoiditis following scarlet fever, and that two days previous to operation the temperature gave no indications of sinus involvement.

Improvement of Symptoms in Spite of Presence of Pathogenic Bacteria in the Blood.

Dr. Sheppard called attention to a case now under the care of Dr. Stickle and himself at the Jewish Hospital, Brooklyn. The patient, a man 40 years of age, came into the hospital three weeks ago complaining of pain in the ear. There was only slight mastoid tenderness, but a thickened, reddened condition with bulging of Shrapnell's membrane were noted. Tympanic cavity comparatively dry on incision of the membrane. Douching was at once resorted to, and the temperature fell to 100°, varying during the next three days from 100° in the morning to 104° in the afternoon. The mastoid tenderness immediately disappeared. A blood culture was taken, on which, for some reason, no report was received for several days, announcement finally being made of the presence of large numbers of the bacillus streptococcus mucosus capsulatus. In the meantime the temperature (always taken per rectum) suggested the diagnosis of typhoid fever. No positive Widal reaction could be obtained. Before the blood culture report was received the patient's condition had improved so much that it was decided to wait for another culture to be made. Report upon this was to the effect that there were more germs in the blood than were found with the first culture. The man was feeling so well that he wanted to go home, but he was kept in the hospital much against his will. Blood counts were made every day, the last one showing seven to eight thousand leucocytes, and 63 per cent polymorphonuclears. The germs are still in the blood and the patient still begs to go home.

DISCUSSION.

Dr. Dench said the case was a unique one. All such cases in the New York Eye and Ear Infirmary had died in spite of operation.

Dr. Gruening emphasized the importance of considering the clinical symptoms and not depending entirely upon the blood culture. At Mount Sinai Hospital the physicians are in touch with the otologic department and they know the symptoms to which sinus thrombosis gives rise. In the class of people who come to the hospital for treatment the ear symptoms are ignored for a time until additional symptoms appear. The ear may not discharge any more, but the patients may have chills and fever, when they are admitted to the medical ward. The physicians would make the diagnosis of sinus thrombosis from the history and clinical symptoms, and not rely solely on the blood culture. So if the medical men make these diagnoses it is because they have the benefit of the otologic service and know the symptoms of sinus thrombosis. In some of the European papers it has been stated that in America no operation for sinus thrombosis is made until the result of the blood culture has been ascertained. In a series of cases which the speaker had reported, he distinctly stated that he did not wait for the blood culture. If the clinical symptoms are positive and the blood culture is negative he would operate. A positive blood culture may be of much significance in obscure cases without definite clinical symptoms.

Dr. Duel considered the presentation of the cases of Dr. Sheppard and Dr. Whiting to fairly represent the position held by most otologists with reference to bacteremia. In one case the patient had a suppurating ear, with clinical symptoms which showed him to be in a serious condition; examination of the blood showing the presence of bacteremia; the whole evidence leading to operation for sinus thrombosis, with recovery of the patient. In the other case there were no clinical symptoms, and the mere presence of bacteremia had not warranted an operation. A number of cases had been reported by him and others in which cultures had revealed bacteremia. Despite this fact there had been no clinical symptoms of sinus thrombosis, and the patients had recovered without operation. In other cases there had been evidences of bacteremia, with clinical symptoms of sinus thrombosis; operation had been performed, and the patients had recovered. In many cases where bacteremia is present, where the thrombus occludes one of the smaller veins, the patient can combat the systemic infection himself without operation. The clinical symptoms in such cases are evidences of whether or not the patient is combating the condition successfully. Bacteremia is undoubtedly present in many cases where sinus thrombosis has not taken place. It is fair to suppose that bacteria are in the vein long before thrombosis occurs. Inflammation of the vein wall is necessary for clot formation, and this is caused by the presence of bacteria. These may be swept into the circulation before any clot is formed. While a bacteremia when present may usually be demonstrated by the removal of, say, ten cubic centimeters of blood from the median cephalic vein of the arm, this amount might not be sufficient to show its presence, while removal of twenty cubic centimeters (or five hundred, if this were practicable) would demonstrate it. A certain amount of bacteremia is bound to occur in any suppuration. If the infection causes a sufficient amount of inflammation to lead to a phlebitis resulting in the formation of a clot, and this subsequently breaks down, throwing large numbers of bacteria into the circulation, the patient may be overwhelmed; then the necessity of operation arises. In the case reported by Dr. Sheppard, where the bacteremia was not sufficient to cause clinical symptoms, the speaker saw no reason for operating.

Dr. Kenefick recognized Dr. Whiting's case at Mt. Sinai Hospital as the woman on his service at the New York Eye and Ear Infirmary, who was removed from the infirmary as a case of pneumonia. The patient had had ear trouble for almost three weeks, for which she had used camphorated oil, but the structures in the fundus presented no evidence of involvement of the mastoid or of the lateral sinus. Just as he was about to operate on account of the sleepless nights and the three weeks of acute middle ear suppuration, the patient was taken from the infirmary.

Dr. Sheppard, in closing the discussion, added that a short time before the patient came under his care he had had some intranasal operation in the dispensary. He still had pus in his nose when he entered the hospital, and there was room for doubt whether the infection had taken place from the nose, through the ophthalmic veins, or through the lateral sinus. This had been a deterrent factor in the matter of operation.

Answering a question by Dr. Haskin the speaker said the vaccine treatment had not been employed. In consultation with the pathologist concerning the matter, the latter stated that the germ was one of a low order of vitality, that the leucocytes were taking care of it, and that in such cases vaccine treatment is contraindicated.

ABSTRACTS FROM CURRENT LITERATURE.

I.—EAR.

The Third Contribution to the Etiology of Otosclerosis.

Cornet (*Revue Hebdomadaire,* February 12, 1910) reports 18 cases of otosclerosis where a complete examination has been made and some modification of the normal nutrition observed. This takes the following forms:

Arteriosclerosis, eight cases;

Gastrointestinal autointoxication, four cases;

Atonic gastrointestinal intoxication, two cases;

Hepatic insufficiency, one case;

Renal insufficiency, one case;

Renal insufficiency with alcoholic indigestion, one case;

Successive pregnancies added to chronic gastrointestinal toxemia, one case.

Excluding the eight cases of arteriosclerosis there are ten cases of true otosclerosis, all of which present some modification of the normal function of nutrition. As a result of his study of these cases it is the author's opinion that in otosclerosis, with rare exceptions, there is a modification in the elimination of the chlorides. *Harris.*

Results of Autogenous Vaccine Therapy in Acute and Chronic Middle Ear Suppurations.

S. J. Kopetzky (*New York Medical Journal,* October 15, 1910) has treated fifteen cases of suppuration of middle ear with autogenous vaccines. The results obtained by the treatment in these cases is as follows:

Of the six cases of chronic suppuration with bone lesion improvement was shown in one case and no result in the other five. In the five cases of chronic suppuration without bone lesions there were four cures and one case of improvement, while all four cases of acute middle ear suppuration were cured. The author concludes:

"It is obviously impossible to draw final conclusions from so small a number of cases, but because they were selected to represent groups of middle ear suppurations, the results thus far obtained are worthy of note. The uniform failure to effect any results in the cases with bone lesions was logically to be expected. The study has, on the other hand, shown that autogenous vaccine therapy has a field of usefulness in otology in properly selected cases; that is, among such where the subsidence of bacterial activity means the end of the lesion. In acute cases, after the period of violent onset and its coexisting constitutional reaction has subsided, the added immunity acquired through vaccine therapy seems to rapidly cure the diseased ear." *Harris.*

Intervention Upon the Jugular Bulb.

Moure (*Revue Hebdomadaire,* March 19, 1910). This includes intervention with opening the bulb, lavage from the sinus to the jugular vein, drainage, curettage and tamponing. Any of these measures can in certain cases give good results. They can be regarded, however, as only superficial measures, and where they do not succeed a thorough exposure of the bulb is demanded. This has been performed in a number of ways. Chipault was the first to perform it. Later Jansen and Grunert practiced it, while Voss in 1904 proceeded by the mastoid route and not the external method by the base of the skull as did the others. Ivanoff in 1903 operated in a similar manner, following the sinus down to its juncture with the bulb by removal of the lateral wall.

Moure concludes as the result of his observation in a recent case that the best method consists in having no absolute method, but to allow oneself to be guided by the lesion present and what one finds. In this way one will be led sometimes to open the bulb through the anterior wall and other times through the posterior. He regards pulsation of the walls of the sinus as pathognomonic of infection therein.

After completing work upon the sinus as low down as possible it is his custom to let 24 or 48 hours elapse; if the pyogenic phenomena persists, then opening of the bulb is called for.

Finally it must not be forgotten that anatomic difficulties are not wont to be met with in a patient suffering from disease in this part. *Harris.*

A Case Presenting Meniere's Symptoms Along With Facial Paralysis.

BRUCE AND FRASER (*British Journal of Laryngology*, August, 1910) give a table of the various conditions which may give rise to Meniere's symptoms. Meniere's disease is an apoplectiform occurrence of Meniere's symptoms and is usually attributed to hemorrhage of the labyrinth. Almost all cases reported have been cases of leukemia.

Their patient was a man of sixty-five, who was under observation for some time. He died from fatty dilatation of the heart and pulmonary tuberculosis. A diagnosis was made of neuritis of the facial and auditory nerves in the internal auditory meatus. Hemorrhage in this situation was also mentioned as the probable cause of the symptoms. A careful microscopic examination was made of the left inner ear and auditory and facial nerves. The result of this examination was as follows:

The inner ear was almost normal; there was no hemorrhage in the endo- and perilymphatic spaces of the cochlea, vestibule or canals; the membranous labyrinth was also almost normal as was the spiral ganglion; the neuroepithelium of the utricle, saccule and of the cristæ ampullarum was well preserved. In the lower turn of the cochlea Corti's organ was absent or degenerated. The mucous membrane of the middle ear was normal.

The functional examination made at the time of admission showed the case to be one of chronic progressive labyrinthine deafness. *Harris.*

Aural Tuberculosis in Children.

WILLIAM MILLIGAN (*British Journal of Laryngology*, October, 1910), speaking from a large experience, believes that aural tuberculosis in children is far more frequent than is usually supposed. About 20% of hospital children under six years of age suffering from purulent otitis media owe the origin of the disease to an underlying tubercular infection. Contrary to the usual view, he does not think that primary tuberculosis of the ear is rare. An uninfected tubercular discharge from the ear is thin, watery and for the most part odorless, containing white or gray granules. The chronic type of the disease is much more common than the acute. Disease of the underlying bone occurs at an early stage. Progressive cario-necrosis leads in time to the exposure of the dura mater and adjacent structure. The loss of one or more of the ossicles is wont to occur. The early enlargement of the periauricular glands is peculiarly characteristic of primary tubercular otitis media.

The channel of infection by means of which the bacteria enter is a varied one: through the ear, lymphatics, blood vessels, perforated drum membrane. The most common route is by way of the respiratory system, but the author feels that the importance of ingestion tuberculosis is underrated and urges a careful investigation of the milk supply, his theory being that the bacillus is swallowed with the milk and that regurgitation of the food so common in children forces a portion of it into the tonsil crypts, nasopharynx and neighborhood of the Eustachian tubes while the regurgitation and suction movements of the child carry the bacilli towards the tympanum. The symptoms are: Painless onset, absence of inflammatory reaction, frequent presence of one or more perforations, early appearance of enlarged periauricular glands and facial paralysis. When pyogenic infection has taken place the discharge becomes purulent.

The diagnosis is not always easy to make. The finding of the bacilli in a discharge from the ear is difficult at all times. A more certain method of diagnosis is the examination of portions of tufts of exuberant granulation tissue from the depths of the tympanum. More exact and reliable still is the inoculation of guinea-pigs with portions of bone or granulation tissue. In place of this more elaborate method results can be obtained from the Von Pirquet reaction.

Prognosis is poor. Early and thorough operation is advocated, even to the extent of the greater portion of the ear. Children suffering from tubercular otitis media should be segregated and every effort used to raise their powers of resistance. *Harris.*

II.—NOSE.

A New Method of Operating on the Hypophysis.

FEIN (*Wien. klin. Wochenschr.*, No. 28, 1910, p. 1035) proposes to enter the body of the sphenoid by going first through the maxillary sinus. A typical Luc-Caldwell is done, the ethmoid cleaned out, the posterior end of the septum removed and the sphenoid opened. He has several times operated on the cadaver without difficulty. *Horn.*

Ethmoidal Neurosis.

Killian. The anatomy, physiology and pathology of the first branch of the trigeminus are carefully reviewed. He strongly recommends, in all cases of nasal asthma, in vasomotor disturbances, hay fever and neuralgias having their origin in the ethmoidal nerve, the simultaneous cauterization, with trichloracetic acid or chromic acid, of the four points which are always affected, viz.: The tuberculum septi on both sides and the regions just above the anterior end of the inferior turbinates. The results in some cases of hay fever last through the entire season or may have to be repeated once. In severe cases, where the local cauterization fails, he recommends the division of the stem of the ethmoid nerve in the orbit. An incision is made as for the Killian operation, but through skin and periosteum. The latter is then raised up down to the nerve, and the nerve together with the artery and vein, are cut through. The bleeding is easily controlled. In the discussion many cases were cited where the operation had been carried out with great benefit. *Horn.*

A Case of Primary Tuberculosis of the Nose.

Seymour Oppenheimer (*New York Medical Journal,* June 11, 1910). The patient was a man of thirty-four, who had suffered from nasal obstruction for a number of years. For this he had undergone numerous operations. When seen by Oppenheimer there was a perforation of the septum. The defect was filled with a mass completely obstructing the nares. The nasal septum was enormously thickened. Apparently the growth was attached to the septum. It was not very vascular, rather pale and friable. In appearance it resembled papilloma, while the septal enlargement was indicative of chrondroma. Microscopic examination showed giant cells and tubercle bacilli. The growth was removed by a Rouge operation. Three years afterward there had been no recurrence.

Harris.

Visual Fields in Accessory Sinus Disease.

A. MORGAN MACWINNIE (*New York Medical Journal,* August 13, 1910) has carefully studied the visual fields in five cases of disease of the accessory sinuses. As the result of this investigation he makes the following conclusions:

"1. The central visual acuity may or may not be diminished, although it is usually lessened.

"2. Normal visual fields without scotoma would indicate imperfect perimetric chart, hasty procedure, or indifferent taking of the same.

"3. The absence of pus in the nose, with or without proptosis, does not indicate a normal sphenoid.

"4. Relative scotoma for red or white are always present, regardless of whether the blind spot is enlarged or not.

"5. Contraction of the field of vision always for red, may be for white.

"6. Scotomata disappear before the field enlargement takes place, following operative procedures." *Harris.*

Four Complications and Two Deaths Following Probe Punction of the Antrum of Highmore.

CLAUS, Berlin (*Passow and Schaeffer Beiträge,* Bd. IV, p. 88). The operation of washing out the antrum for diagnostic purposes is a matter of such routine procedure that one often loses sight of the fact that it can be accompanied by serious accidents quite apart from the skill of the operator. The report of the following four cases comes to us with somewhat of a shock and warns us to be ever on the alert for any symptom which would indicate approaching trouble.

1. Air Embolus, Following a Washing Out of the Antrum.—A girl of 19 years, who five years previously had been radically operated upon, returned to the clinic complaining of headache. The old nasal opening had closed and a Lichtwitz needle was, on account of the great thickness of the bone, jammed with considerable difficulty into the antrum. Pressure on the bulb of the syringe gave evidence by the sound of the outcoming air, that the needle was properly in place. Suddenly the bulb resisted the pressure of the hand, and in that instant the patient became dyspnotic and had a feeling of anxiety. There was a distinct facial cyanosis. The pulse was 75 and full. The patient was placed on her back, the clothing

loosened and in about 10 minutes the cyanosis and dyspnea disappeared. A feeling of constriction in the chest lasted for several hours.

Claus can explain the case in no other way than by assuming that after the needle had entered the antrum it was accidentally withdrawn so that the point lay in the spongy bony tissue of the thick nasal wall. When the syringe was pressed a bubble of air entered an open vessel and the attack resulted.

2. Apoplexia Cerebri During Washing Out of the Antrum. —A man 68 years old, who had been under treatment for a long time, fainted suddenly, while the antrum was being entered from the inferior meatus. He was immediately admitted to the hospital, where it was noted that he had already developed a paralysis of the right arm, but that the right leg was intact. The patient did not react to a needle point, either on the right or left side. During the night the patient was uneasy; when spoken to he gazed in an uncomprehending manner and could not answer questions. The next day his mind was clear and he was able to recognize his physicians and seemed to recognize common objects, but was unable to give their names. His speech was thick and articulation very poor. The right arm could be moved a little, but the movements of the right leg had become worse. In six days the symptoms of the paralysis had entirely disappeared. The attack is explained not as an embolus or bleeding of the internal capsule, but as a cramp of a blood vessel in that region brought about by the use of the novococain solution.

3 and 4. Sudden deaths following washing out of the antrum in two cases.

A. A cotton tampon containing 6 drops of novocain (10%) and 3 drops of adrenalin was laid for 20 minutes in the inferior meatus. After washing out the antrum in the ordinary way the patient became faint and cyanotic. Various methods of resuscitation and stimulation were used, but in a few moments the patient was dead. The autopsy showed nothing of consequence. The cause of death was given as paralysis of the heart.

B. The second case, a woman of 36, was anesthetized like the first. The punction was made without difficulty. A little air was blown through, and the patient suddenly collapsed into a deep comatose state. As a result of the artificial respiration and stimulation the condition of the heart improved somewhat, but toward evening grew worse again. The patient died without recovering consciousness. The autopsy showed numerous hemorrhages in the substance of the heart muscles and gray matter of the cerebrum and cerebellum. The only explanation possible was to assume a poisoning from the novocain, although the same procedures had been carried out many times on these patients, and thousands of times on others, without such results. *Horn.*

Immunization Treatment of Hay Fever.

SCHEPPEGRELL (*Revue Hebdomadaire*, February 19, 1910). Hay fever is not caused by a special pathogenic germ, but by a vegetable pollen which acts as a physicomechanical irritant on the mucous membrane of the eyes, nose and throat. The symptoms that result do not depend upon the absorption of the pollen, but upon the simple inflammatory reaction, upon troubles of respiration due to the irritant and upon the general effect on the nervous system.

This pollen in a large majority of cases proceeds from the ragweed. So direct is the connection between the pollenization of the ragweed and hay fever that it is possible to predict to a day the appearance of the fever in a given case.

Before the treatment is undertaken the nose should be put in as normal condition as possible. In 15% of his cases such treatment has been prophylactic.

A study of the phenomena in a given case shows that nature develops tolerance, which is slight at first and is soon overcome by the irritation, but increases rapidly, and by the end of the second week counterbalances the irritation, and by the end of the fifth week the majority of patients are relatively comfortable. The object of the treatment is to develop an artificial tolerance to the irritating pollen before the beginning of the attack and thus to establish an artificial immunization. This immunization is not permanent. Treatment must not be abandoned before the arrival of the hay fever season. For the treatment the author employs two teaspoonfuls of the male flowers in a piece of sterile gauze, in this way making a sack which the patient carries to the nose and agitates gently; this permits the pollen to escape. At the end of ten treatments the irritation diminishes considerably. The flowers must be changed from time to time. The male flowers of the previous year are the best.

Sufficient time has not elapsed to demonstrate the method in a large number of cases, but so far the results have proved encouraging. The simplicity and economy of the method commend themselves. *Harris.*

The Radical Operation for Chronic Maxillary Sinusitis With Local Anesthesia.

DENKER (*Archives Internationales de Laryngologie,* July-August, 1910) up to recently has not believed in doing the radical operation on the antrum under local anesthesia; now he makes use of this method exclusively and with uniformly good results. Half an hour before the operation he uses an injection of morphin. The buccal mucosa is then swabbed with a 10% solution of cocain with adrenalin. Novocain and adrenalin are used in the following proportions: One part novocain to 100 gr. of normal salt solution, to which is added eighty drops of 1/1000 adrenalin solution. The needle is introduced a little above the first premolar tooth. The solution is carried forwards and backwards, filling all the adjacent area. Then it is introduced under the periosteum in the lower border of the orbit. Finally by means of the finger externally as a guide the needle is carried through the soft parts of the cheek and from one to two cm. of the solution introduced into the region of the nerve. A 10% solution of cocain is placed in the inferior meatus, and after ten minutes the operation is begun. Upon the exposure of the antrum a fresh injection subperiosteally is made in the lateral wall of the inferior meatus, and the lining membrane of the cavity is backed with a 10% solution of cocain. Altogether from ten to twelve cm. of the solution are employed. *Harris.*

Pathogenesis of Perforating Ulcer of the Nasal Septum.

SCHIFFERS (*Revue Hebdomadaire,* April 23, 1910). Such an ulcer should be called more exactly round ulcer, or simply ulcer of the septum. It is situated on the anteroinferior portion of the septum. Where an ulcer is irregular, it is no longer simple, but of syphilitic or tubercular origin. The most common cause is an infarct. This is difficult to demonstrate, because the ulcer can be preceded by an arterial ligature constituting a distinct morbid entity. There is no ground for the theory of congenital origin. Tuberculosis is to be excluded as well as a syphilitic origin. A bacteriologic origin is claimed by certain authors, among them Hajek, Weichselbaum. It is true that staphylococci and streptococci are found in the ulceration, but they are usually found in the healthy nose, and so cannot be regarded as indications of the disease. Schiffers inclines to the pathogenic origin, therefore, because of the presence of the infarct in the great majority of cases.

Harris.

Consideration of the Pathogenic Theories of Ozena.

Jouty (*Archives Internationales de Laryngologie,* May-June, 1910) considers, in order, the various theories which have been advanced for ozena. The atmospheric theory of Freudenthal he believes has some truth in it. He attaches no importance to the theory of metaplasia of the epithelium nor to the view of Cholewa that it is of osteomalacic origin. He believes that some weight should be attached to the theory of Zaufal that ozena is due to excessive enlargement of the nasal fossæ. The results obtained in the treatment of atrophic rhinitis by submucous injections of paraffin cannot be regarded as sufficient proof, inasmuch as paraffin acts as a foreign body modifying the atrophic condition where it is found. Little weight, in his opinion, is to be attached to sinus disease as the cause of atrophic rhinitis. The ozena usually begins in infancy when the sinuses are not developed. In the nose, where the ozena is most marked, the mucous membrane is atrophied, while in the sinuses it is hypertrophied. Finally treatment of the sinuses is attended by a cure, which is not true of atrophic rhinitis.

Syphilis and tuberculosis as etiologic factors have not sufficient proofs in their favor. A specific infection the author regards as the most probable cause of ozena. Perez, of Buenos Ayres, has done extensive work in this direction.

He divides the infections into four categories:

1. Cases of human contagion originating in the family.
2. Cases of human contagion not originating in the family.
3. Cases of probable canine contagion.
4. Cases of undetermined origin.

Various men have claimed to have discovered the bacillus.

That discovered by Perez has attracted the most attention. Cultures of this bacillus give the characteristic odor of ozena crusts. When, for example, a dog is inoculated with this culture, there is produced a reaction of the mucous membrane, with abundant thick, yellowish green discharge and crusts. Perez has observed complete atrophy of the turbinals in a rabbit infected with his bacillus. The confirmation of these observations of Perez is necessary before a positive statement as to their value can be made. Finally, the author considers the trophoneurotic theories. Delacour believes that ozena forms part of the adenoid syndrome consecutive to atrophic troubles due to modification of the thyroid function. He groups appendicitis, inflammation of Waldeyer's ring and ozena, and believes that they are all marked by the presence of adenoid tissue. Ozena is a local trophoneurotic manifestation, most often fetal in origin, which appears soon after birth or has for its development additional infection, such as diphtheria or scarlet fever.

Higguat has called attention to the relation between ozena and the affection of the thyroid. After the removal of a goitre a case of atrophic rhinitis in his hands entirely cleared up.

The author advances the opinion that ozena can be due to dystrophy, caused by trouble in the function of certain of the internal gland secretions, and reports two cases of ozena in young girls, in one of whom, after the establishment of menstruation, and in the other after marriage, all the atrophic symptoms disappeared.

An argument against the infectious theory of Perez is the inability to cure ozena by any known form of antiseptic. Further, the successes obtained by the submucous injection of paraffin are hard to reconcile with the infectious theory, while they tend toward confirming the neurotrophic theory, as does the success recently reported by Mermod in cases of unilateral ozena by simple correction of the nasal septum.

Harris.

III.—PHARYNX.

A Few Facts Concerning the Cause of Failure in Adenoidectomies.

J. Vernon White (*New York Medical Journal,* September 3, 1910) places especial emphasis, as possible cause, failure to recognize:

1. "The peculiarities in shape of the space on either side of the rostrum of the sphenoid bone;
2. "The location of the fossa of Rosenmüller and its relation to the orifice of the Eustachian tube;
3. "The condition known as Thornwald's disease."

"An adenoidectomy properly done must, therefore, remove vegetation from these localities or at least positively exclude their presence there. It must exclude Thornwald's disease or properly treat it if present. With these precautions results will become more satisfactory. Only then will the promises of complete cure so emphatically made before operation be corroborated by the local and constitutional improvement of the patients in every case. Failure heretofore so common will be a thing of the past." *Harris.*

The Nasopharyngeal Origin of Chorea.

de Ponthière (*British Journal of Laryngology,* September, 1910). As the result of a large experience, the author is convinced of the great frequency of the rheumatic origin of chorea and the equally frequent nasopharyngeal source of the rheumatism. By the removal of this source of intoxication formed by the tonsils or adenoids he is wont to obtain prompt and lasting success in the treatment of this condition.

Harris.

The Radical Tonsil Operation.

Tenzer, Vienna (*Wiener klin. Wochenschr.,* No. 27, 1910). It is surprising, with all that has been written in America about the radical tonsil operation, that until now nothing of general value has appeared in the German press concerning this subject. Tenzer seems to have a thorough grasp of the subject, and furthermore is fully acquainted with American literature. The bibliography at the end of the article is one of the best that the reviewer has yet seen. The ball was started rolling at the last International Congress, when Welty, of

San Francisco, operated, at the Vienna Clinics of Chiari and Hyak, several cases of tonsils. The ease with which the operation was carried out greatly impressed the local men, and great enthusiasm has since been manifested in the matter.

Tenzer gives to Robertson the credit of the first important description of the present radical operation. The article appeared in the *Journal of the American Medical Association* in 1903. The historical development both here and abroad is carefully worked up, and especially the clear relation which exists between tonsillar disease and other diseased conditions in the body is for the first time plainly stated. He, however, still holds that the large hypertrophic tonsil is a protective expression on the part of the organism and that its radical removal is not necessary.

His method of operating is the same as most of the modern American methods, but he uses local anesthetics exclusively and does not even mention the advantages of the general anesthetic. The most interesting part of the article is his original investigations on the blood supply of the tonsil, and the illustrations are very valuable. By injecting the external carotid with Teichmann's mass he came to the following very important conclusions:

The following variations in the blood supply of the tonsil are found:

1. The arteria palatina ascendens has its origin from the external carotid, and at a level with the tonsil gives off the tonsillar artery.
2. The arteria palatina ascendens may branch from the arteria maxillaris externa.
3. The arteria tonsillaris may branch directly from the arteria maxillaris externa.
4. The tonsillar or ascending palatine may branch from the lingual.
5. The tonsillar artery may branch directly from the external carotid. In this case the branches may be multiple and very large.
6. The external maxillary artery sometimes makes a strong bend upward to a level with the tonsil and can easily be injured.
7. The same condition can take place with the lingual.

Stress is laid on the fact that the tonsillar artery can pass directly into the capsule or can run in a tortuous condition on the surface of the pharyngeal musculature before entering the capsule. When such a condition exists the danger of injuring a vessel is ever present, especially if sharp instruments are used in the dissection.

His final conclusions are as follows:

1. A tonsillectomy is indicated in: (a) Every case of purulent tonsillar disease in adults, where the tissue does not project between the pillars, and where there are recurrent attacks of quinsy. (b) All cases of prominent tonsils of this type where conservative measures have failed.

2. In comparison with other operations the radical enucleation of the tonsil has overwhelming advantages.

3. The operation must be only carried out in a hospital.

Horn.

Congenital Insufficiency of the Palate.

A. Brown Kelly (*British Journal of Laryngology,* June-July, 1910) has made a careful study of this condition, based upon 19 cases which have occurred in his practice. He defines congenital insufficiency of the palate to be a congenital affection in which the soft palate does not effect the physiologic closure of the nasopharynx from the oral cavity and rhinolalia aperta results.

There are two varieties, submucous cleft palate and muscular insufficiency.

The most important of the conclusions which he makes are the following:

"Submucous cleft palate is characterized by the presence beneath the intact mucous membrane of a notch or gap in the posterior part of the hard palate, and the imperfect union in the middle line of the muscles of the two halves of the soft palate, also by a shortening of the hard and soft palate."

"In submucous cleft palate the epithelial coverings of the palatal processes have united across the middle line, but development has been interrupted before the mesoblast contained in these processes has also effected a meeting."

"A submucous cleft palate may be sufficient or insufficient, according as rhinolalia aperta is absent or present."

"The conditions in submucous cleft palate which determine sufficiency or insufficiency are: The length of the hard and soft palate, the degree and mode of elevation of the soft palate, the depth of the pharynx, the degree of prominence of Passavant's cushion, and the amount of approximation of the palato-pharyngei."

"Congenital muscular insufficiency of the palate is characterized by imperfect elevation of the palate during phonation, owing to defective or abnormal muscular action."

"In congenital muscular insufficiency there are no signs of interrupted development, such as are associated with submucous cleavage of the palate, e. g., notching of hard palate, nonunion of muscles in middle of soft palate, bifid uvula, shortness of hard and soft palate."

"The probable cause of congenital muscular insufficiency of the palate is the defective or unequal development, or abnormal disposition, of the muscles of the soft palate. The occurrence of such conditions is known anatomically, but their relation to the disease under discussion has not yet been proved."

"The insufficiency in submucous cleft palate is due to the palate being too short or too far from the posterior pharyngeal wall; the insufficiency in congenital muscular insufficiency is due to neither of these causes, but to the weak and ineffective action of the levators of the palate."

"The speech is similarly affected in both varieties of congenital insufficiency of the palate, but while in submucous cleavage there is simply rhinolalia aperta, in muscular insufficiency certain of the letters may also be imperfectly formed."

"The absence of regurgitation in all of the cases proves that deglutition can be satisfactorily performed with a palate which is either too short to reach the posterior wall of the pharynx, or in which the muscular action is insufficient to bring it into contact with the posterior wall of the pharynx."

"The ears are affected in nearly 80% of all cases; in submucous cleft palate the complications are more frequent and more severe than in muscular insufficiency."

"Functional rhinolalia lasting for months is the only affection likely to be confused with congenital muscular insufficiency of the palate; consideration of the history of the case will allow a distinction being drawn."

"The prognosis in children in slight cases is favorable; some make a perfect recovery. Marked cases and adult subjects may be improved, but a considerable degree of rhinolalia aperta usually persists."

"The best treatment is probably Gutzmann's method of massaging and stretching the soft palate." *Harris.*

IV.—LARYNX.

Radium Therapy in Cicatricial Stenosis in the Laryngotracheal Tract

CANTAS (*Archives Internationales de Laryngologie,* May-June, 1910). Laryngostomy has acquired a definite place in the treatment of cicatricial stenosis of the larynx and trachea. The proper method for the subsequent dilation is still under dispute. The French school advocate the so-called rubber dilation, which operates rapidly, but more painfully. Others are in favor of a dilation by means of a gauze tampon, a slower but less painful method. The Italian operators favor a tampon of wood. Each method has something to be said in its favor, but they all require many months, repeated dressings and are wont to be complicated with severe bronchial pneumonia, and relapses are not impossible.

Whatever the method employed to secure dilation, the aim is to obtain new tissue in the laryngotracheal tract, the walls of which no longer show any inflammatory reaction. For this purpose and based upon the remarkable results obtained elsewhere in the body, the author regards radium as the most promising agent to be employed.

Wickham and Degrais have made use of it for the removal of cicatrices and state that while it did not seem in their hands to have any beneficial effect upon certain cicatrices, the most unexpected results were obtained on others. The most important result was the return of the tissues to their former suppleness.

The form of the application of the radium will depend upon the particular case. It can be applied either in the form of compound radiation or ultrapenetrating radiation. In the former method most of the rays are allowed to pass through, while in the latter a sheet of metal is used to intercept all but the ultrapenetrating rays. A sheet of paper arrests the secondary radiation. The entire tube is enclosed by a thin layer of rubber to protect the apparatus from organic liquids.

For the purpose of reaching cicatrices in the larynx and trachea an O'Dwyer tube will serve admirably. According as the full or partial radiation is required, the radium will be placed upon the tube, outside or inside.

Two conditions may be met with: Either the larynx or trachea is slightly stenosed with its lumen still free, or there is complete stenosis with no lumen present. In the former case, after laryngostomy has been performed, the author recommends the use of the ultrapenetrating radiation, the object to be secured being the specific action of the radium rays and not their destructive action. The tube is charged with 0.05 cg. of sulphate or bromide of radium and placed in position for twelve to forty-eight hours. Three or four weeks later, according to the result, the application will be repeated once or twice. In the interval the treatment will be the application of a simple O'Dwyer tube covered with one or more thin layers of gutta percha and left in position for one or more hours each day.

The second form met with is where intubation is impossible. Here also the application of the radium would be preceded by laryngostomy. With a partial or total removal of the cicatricial tissue or simple incision, great care must be taken not to wound the healthy cartilage below. If only a part of the cicatricial tissue has been removed the compound radiation is preferable; in that way both the specific and destructive action of the radium rays are secured. If, however, all the cicatricial tissue has been removed the specific action of the radium alone is required. Finally the two methods can be combined. Where it is desired to destroy excessive cicatricial tissue the O'Dwyer tube will be covered outside with a cloth charged with radium of an activity of 500,000. This will be left in position for two hours at a time, the treatments separated by several days. An intensive reaction of the cicatricial tissue takes place, with the production of an eschar which falls off toward the end of the sixth week, showing a red surface which, after eight or ten weeks, becomes a smooth and regular cicatrix. During the interval dilation with vaselinated gauze can be employed.

The method of choice, in the author's opinion, is the combination of the compound radiation and the ultrapenetrating radiation. The major part of the cicatricial tissue is destroyed by the more intensive action of the radium, while the ultrapenetrating rays will act upon the part remaining.

Although lacking actual experience, the author is exceedingly optimistic of the results to be obtained. He feels that the length of the treatment will be decidedly shortened and the resulting tissue will be smooth, supple and nonexuberant, permitting the re-establishment of the normal function of the larynx. *Harris.*

Paralyses of the Recurrent Laryngeal Nerve.

Broeckaert (*British Journal of Laryngology,* March, 1910). This elaborate paper, presented at the Section of Laryngology of the Sixteenth International Medical Congress, has been abstracted in English by K. Dickerson.

Of the many points brought out in this abstract the following are the most important:

1. *Recurrent Paralyses of Cerebral Origin.*—"As the result of the combined experience of different authorities, it has been found that the center which controls the movements of the vocal cords in the dog is placed symmetrically on both sides of the median line, exclusively or predominantly in front and below the precrucial fissure. Without being able to deny that there are cortical centers which have an influence alone on the abduction of the vocal cords, or those upon which barking depends, their existence is, however, far from being demonstrable."

"Since even the most extensive destruction of the cerebral laryngeal centers only suppresses the voluntary movements of the vocal cords, leaving unaffected the reflex mobility, it is logical to conclude that absolute immobility of a vocal cord in the cadaveric position can on no account depend on a cerebral lesion."

2. *Recurrent Paralyses of Bulbar Origin.*—"The localization of a laryngeal center in the medulla is not yet established quite exactly." "A case of syringomyelia with laryngeal paralysis, which we owe to the kindness of Schrötter, proves that the ambiguous nucleus in man constitutes a laryngeal center. In opposition to Semon's law, there are numerous observations of recurrent lesions of bulbar origin, in which it is noted that the constrictor muscles were alone affected."

3. *Recurrent Paralyses of Peripheral Origin.*—The reasons which led Semon to formulate his law are given, and the author then proceeds to examine critically the position. As

the result of his investigations he regards it proven that the trunk of the recurrent is a mixed nerve, which contains in a single bundle almost all the motor nerves of the larynx as well as the motor and sensory nerve supply of trachea and esophagus. The author has confirmed Krause's experiment of separating the recurrent nerve in a dog and subjecting it to moderate and continuous pressure, obtaining in this way immobility of the vocal cord near the median line, but he does not regard this experiment as comparable to the results of slight and progressive pressure, which is observed pathologically. Experimental elimination of the posticus muscle by extirpation does not in a single instance show the cord fixed in the median position. Even if it is true that in the cadaver the postici can lose their contractility more quickly than the other muscles of the larynx, it does not follow that in the living subject the abductor group is in a manifestly inferior condition. The incessant activity of the posticus muscle, on which rests, during quiet respiration, the maintenance of the opening of the glottis, may explain its more rapid loss of vitality postmortem.

The most rigorous anatomopathologic investigations do not give any arguments in favor of Semon's law. In the rabbit atrophy of the nerves is wont to attack first the external thyroarytenoid. In all the cases which have been reported, including four of the author's, the recurrent was found embedded in a mass of glands, and the destructive process had gone on to the complete disappearance of the organic part of all nerve fibers and the loss of the function of conduction. The atrophy was always found to be of the same degree in all muscles supplied by the recurrent.

A study of recurrent paralysis clinically shows three stages, one of motor paresis with progressive diminution of the motor abductor movements, a second showing the cord in the median position. This position in a great number of cases, while more median than the so-called cadaveric position, is removed a certain distance from the median line. "The characteristic symptom of this stage is the sudden change of voice; this sudden hoarseness rapidly becomes transformed into a bitonal voice. Dyspnea is rarely met with at the commencement of paralysis of the recurrent of peripheral origin; even attacks of suffocation or crises of paroxysmal dyspnea appear quite exceptional." In the third stage the recurrent has lost its conducting power, and the corresponding vocal cord rests in the so-called cadaveric position. "As far as the motor fibers contained in the recurrent are affected in their functional activity, the muscles of the larynx become less and less capable of contraction; this state of the nerve is shown in the laryngoscope by a progressive diminution of the movements of the vocal cord. The lesion attacks, in the same degree, all the nerve fibers, whatever be the muscles which they supply; the gradual loss of trophic influence, stimulating or exciting, occurs, therefore, in the same proportion in the abductor and adductor fibers. But, thanks to the soundness of the ary-arytenoid and cricothyroid muscles, the action of which is added to that of the adductors, thanks to the dynamic superiority of the constrictors over the dilators, it is the respiratory excursions which appear, from the commencement, to be the most limited; it is easy to understand that adduction will still be carried on with a certain amount of energy when abduction will have become very difficult, even almost impossible."

"To explain the immobility of the vocal cord, whether in the median line or quite near the median line, a distinction must be made. When the vocal cord is immobile and placed exactly in the median line, this exceptional position must be looked upon as the effect of a contracture, depending either on a direct peripheral irritation of the nerve trunk or on a reflex irritation. This irritation stage of the recurrent is generally wanting in cases of simple slow and progressive compression of the nerve; it may be observed, above all, in the course of neuritis of the recurrent nerve."

"As regards the immobility of the vocal cord in a position more or less approaching the median line, this is the expression of a deep-seated change, but still incomplete, in the nerve. In fact, at a given moment, the dilator muscle, much paralyzed, becomes incapable of still acting on the vocal cord, which is thus left to the action, more and more feeble, of the adductors, to which is added that of the ary-arytenoid and cricothyroid; account must also be taken of the reflex action which the centripetal fibers contained in the trunk of the recurrent may exercise on the vocal cord."

"Finally, when the paralysis is complete, that is to say, when the conductivity of the nerve is completely abolished, all reflex action ceases as a direct consequence, and the ary-arytenoid and cricothyroid muscles can no longer, of themselves, maintain the cord in its relaxed position, and thus is produced the laryngoscopic image of total annihilation of the nerve."

Harris.

V.—MISCELLANEOUS.

The Treatment of Hysterical Aphonia.

SENATOR (*Berlin. klin. Wochenschr.*, No. 29, 1910, p. 1369). Seifert made the claim that by his method of treating hysterical aphonia, all cases, without exception, could be directly cured. Senator, although finding it of great value, was unable to cure two patients by Seifert's method, which readily responded to other forms of treatment. Seifert's method consists in bending the patient's head as far back as possible. The back may also be bent over the knee of the physician. In this position the patients can always intonate freely. *Horn.*

Epidemic Poliomyelitis.

W. SOHIER BRYANT (*New York Medical Journal*, December 17, 1910) believes that epidemic poliomyelitis is infectious and contagious. It enters the system by means of the nasopharynx. The disease proper, in contradistinction to the sequelæ, is amenable to local pharyngeal treatment. Prophylaxis is attained by nasopharyngeal hygiene. In times of epidemic poliomyelitis all cases of nasopharyngitis should be regarded with suspicion; they should be treated promptly.

Harris.

Latent Infections of the Diphtheria Bacillus.

PATRICK WATSON WILLIAMS (*British Journal of Laryngology*, January, 1910). Cases of latent diphtheria may be grouped under three heads:

A. Patients who offer none of the usual clinical indications of diphtheria, are not definitely ill and yet are found to be anemic or have increased pulse rate, are simply poorly in association with nasal catarrh, membranous rhinitis, faucial redness or slight subacute tonsillitis, otorrhea, sores, etc., which on bacteriologic examination prove to be diphtheritic.

B. Cases with local diphtheric lesion but presenting no general symptoms of ill health—cases which are indisputably latent.

C. Persons who present no local lesions and no departure from normal health, but in whom diphtheria organisms have been discovered by culture tests, e. g., healthy infected contacts.

For the diagnosis of latent diphtheria we have to depend on bacteriology, and the most practical test is a virulence test, morphologic tests being unreliable.

Williams states in regard to treatment that the application of antiseptics gives unsatisfactory results, antitoxin serum has some effect, vaccine may be employed and cataphoresis has, at least in one case, proved beneficial. *Harris.*

Administrative Measures Required for Dealing With Diphtheria Contacts.

Duncan Forbes (*British Journal of Laryngology,* February, 1910). Swabs should be taken in suspects, not merely from the throat, but from the nose as well. It has been shown that 1.9% of contacts in schools had the nose infected while the throat was free. Nasal diphtheria is probably much more infectious than throat diphtheria. In schools in which diphtheria has occurred over 8% are diphtheria carriers. Swabs should be made from the throat of all absentees from the class who return shortly before the onset in the patient, provided there is a history of sore throat or cold. Swabs should also be taken from all scholars present or absent who present histories of sore throat or colds. Even if the swabs are returned negative, all persons with sore throats or colds should be excluded from school for a clear fortnight. The Hofmann or pseudodiphtheria bacillus, in view of the careful investigation in Edinburgh and Manchester, can be disregarded.

It has been proved that antitoxin has no effect on the length of infectivity. It is, however, probable that attacks of diphtheria in contacts are rendered milder by injections and are therefore more readily overlooked. It follows that extensive injections of antitoxin would lead to the nonisolation of certain highly infective individuals. *Harris.*

Lactic Acid Ferment in the Treatment of Ozena and Otorrhea.

Stephenski (*Archives Internationales de Laryngologie,* July-August, 1910) has used the lactic acid ferment in twenty-seven cases of atrophic rhinitis. In every case he has been able to secure the disappearance of the odor in from five to six days and of the discharge in from seventeen to sixty-eight days. In twenty-two of the twenty-seven cases the cure was permanent at the end of one year. His method of employing consists in a preliminary cleansing of the nose, gentle cauterization of the turbinate bodies and a pulverization of the entire mucous membrane with dry lactic ferment. In the interval of the bi- or tri-weekly treatments the patient was given lactic acid ferment in powder form, to be taken twice a day.

He also made use of the ferment in fourteen cases of chronic otorrhea, nontubercular in nature, and in eleven of these cases, without surgical intervention, he succeeded in securing as good results as from the radical operation. In nine of these eleven cases the cure has been permanent.

At each sitting the ear was carefully cleaned, then the galvanic cautery was applied to the granulations or polyps, and finally the cavity filled with the dry lactic acid ferment and sterile gauze, slightly dampened in the ferment, introduced. The cleansing and pulverization was done every day, the cauterization and other treatment only once or twice, very rarely three times, a week.

In spite of his successes the author does not believe that the lactic acid ferment is capable of curing these conditions by itself, but should be employed in connection with certain surgical procedures, such as curettage, galvanic cautery, etc. In this way, as shown in the forty-four cases where it has been employed, it is a decided adjuvant in the treatment.

Harris.

Certain Aspects of Rhinolaryngology and Their Relation to General Medicine.

H. Arrowsmith (*New York Medical Journal,* December 17, 1910). A desultory consideration of certain conditions of the upper respiratory tract, important alike to specialist and general practitioner. Of these the most interesting are the author's conclusions on operation upon the faucial tonsils.

"1. That pure hypertrophy of the faucial tonsil is essentially a phenomenon of early life; that, except in rare instances, it is rather protective than pathologic, and that even a moderate number of attacks of acute amygdalitis rather substantiates than vitiates the presumption of this protective function.

"2. That the cause of this hypertrophy is very often disease of the pharyngeal tonsil, ablation of which will frequently lead to retrogression of its faucial neighbor.

"3. That up to the age of puberty, at least, a moderate pure hypertrophy should be respected as an evidence of some important functional activity, probably protective in its nature.

"4. That in case this hypertrophy, by reason of its excess and consequent mechanical interference with respiration or audition, demands action, the only justifiable operation is that of amygdalotomy, with preservation of the functionating tissue not in excess, and not of enucleation.

"5. That if the disturbances in the tonsillar structure have been, beyond reasonable doubt, the source of neighboring glandular involvements, which in time may menace the general health, the only justifiable operation is not amygdalotomy, but complete enucleation.

"6. That, after the age of puberty, when the tonsil, like the thymus, perhaps loses its physiologic importance and should normally retrogress, pathologic conditions in the way of cryptic, parenchymatous, or adjacent inflammations and infections, with their possible remote evil results, should be dealt with as thoroughly and as radically as our surgical resources enable us, the same, however, to be employed with a discrimination which sees beyond the obvious local phenomena and comprehends their general importance."

Harris.

BOOK REVIEWS.

"Verhandlung des Vereins Deutscher Laryngologen." Meeting at Dresden, May 1910.

Published by Curt Kabitzsch (A. Stuber's Verlag). Unbound, $1.25.

It is unfortunate that not more of our American rhinolaryngologists are acquainted with the yearly proceedings of the German Laryngological Society. The papers are all limited to ten minutes, and the very cream of the past year's experiences and new ideas are served up for the sharp criticism of the fellow-members. It is very seldom that anything gets past the censorship of the committee that is not worth listening to.

This year's meeting was especially interesting. Some of the topics are of such importance that full abstracts will be found in another part of the ANNALS.

Prof. Denken, of Erlangen, to whom we owe probably the best radical operation on the antrum of Highmore, has at last become an enthusiastic advocate of doing this operation under local anesthesia. He describes his technic in full detail and incidentally sharply criticises the advantages claimed by the followers of the Sturmann operation (known in this country as the Canfield operation). On this point he was sustained in the discussion.

Prof. von Eicken, Basel, recommends a preliminary submucuous resection in operating synechiæ of the nose and then tamponing for a few days. This is a procedure which has already been used in America. When the synechia is located in the anterior part of the nose it is covered with Thiersch grafts.

Qarniko, Hamburg, reports 30 cases in which he has done a submucous resection of the inferior turbinate, where the bony part was enlarged, but the mucous membrane not especially hypertrophied. The report was very favorably received, and in the discussion many similar procedures were spoken of.

Gyergyai, Kolozvar, introduced a novel procedure for inspecting and operating on the nasopharynx without the use of mirrors. He places the patient with the head hanging down over the end of the table in the Rose position. Then by looking up the soft palate with his finger and using one of the straight 4-20 mm. tubes of Brunning's he is able to inspect all parts of the nasopharynx with great ease. He was able to a pass a tube a few mm. into the opening of the Eustachian tube and so direct the light that it could be seen on the drum. There was no discussion of the paper. The author, to demonstrate the practicability of his method, has already operated through the straight tube, adenoids, hypertrophic posterior ends of inferior turbinates, choanal polyps. By boring through the body of the sphenoid he has easily reached the region of the hypophysis and the cavernous sinus, and considers it a feasible route in approaching these regions.

Möller, Hamburg, relates some brilliant results from the use of atmokausis in ozena. The procedure consists in allowing live steam at a temperature of 116°—118° C. to come in contact with the mucous membrane of the nose for a period of one second in children and two to three seconds in adults. The nose is first thoroughly cocainized. Following the application of the steam there is a profuse watery discharge, which may last for a few hours or may continue for as many days. The procedure should not be repeated until all reaction has disappeared and never oftener than once in from eight to fourteen days. The results are always favorable. The odor disappears at once, and the crusts are more easily blown from the nose. There was no discussion of the paper.

It is hardly fair to the rest of the participants to pick these few examples from the thirty-odd papers, but they give a striking example of the originality of the work. Out of a total of 395 members, 144 were present. The next meeting place will be Frankfort. *Horn.*

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XX.

THE LATERAL WALL OF THE CAVUM NASI IN MAN, WITH ESPECIAL REFERENCE TO THE VARIOUS DEVELOPMENTAL STAGES.*

BY JACOB PARSONS SCHAEFFER, M. D., PH. D.,

ITHACA.

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*From the Journal of Morphology, Vol. 21, No. 4.

I. Introduction.

A survey of the literature on the lateral wall of the cavum nasi indicates that commendable researches have been carried out by different investigators. Although much careful work has been done, conflicting opinions are held on some points of the development and the gross anatomy of this portion of the olfactory organ. The idea of an unvarying typical form in the gross anatomy of the structures and relations in this region of the nose seems too much in evidence in some of the general text-books of anatomy. In fact the exceptions in some instances to the descriptions given are so numerous that the exception is described rather than the average condition. This is especially true in the manner of communication of the nasofrontal duct with the middle nasal meatus. The ostium maxillare accessorium—a very common aperture indeed—does not receive the recognition it should have. According to my series of specimens, 62.5 per cent of ethmoidal regions possess in the adult three conchæ. Books generally describe and picture two ethmoidal conchæ as the typical number, and apparently would have us think that three ethmoidal conchæ are rather exceptional.

In order to determine whether the embryology would account for the varied adult conditions one meets, I undertook the study of the various developmental stages in the formation of the complex lateral nasal wall. It was deemed essential that the embryologic stages in the formation of the nasal cavity be considered before taking up for detailed study its lateral wall. The paper will, therefore, include: (1) a brief description of the developmental stages of the nasal fossæ; (2) the detailed embryology of the lateral walls of the nasal fossæ; (3) the gross anatomy of the lateral walls as presented in the term fetus and the young child; (4) the adult lateral walls with especial reference to some later developmental changes.

It is obvious that the fundamental structures to be considered in a study of the development of the lateral wall of the cavum nasi are: (1) the nasal meatuses and the nasal conchæ; (2) the accessory furrows and the accessory folds (conchæ); (3) the anlages of the sinus paranasales.

The materials used in this investigation include the following:

a. Human embryos at successive ages from 21 days up to the fetus at term;

b. Fifty lateral nasal walls of new-born children;

c. Twenty lateral nasal walls of children, ranging in age from birth to 15 years;

d. One hundred and fifty adult lateral nasal walls, ranging in age from 15 to 88 years;

e. Embryologic and adult specimens of the lateral nasal wall of the cat, dog, muskrat, woodchuck, skunk, monkey, pig, sheep, and cow.

The lateral wall of the nasal cavity of human embryos, aged respectively 35, 43, 49, 58, 70, 83, 103, 120, 210, and 280 days, was modeled by the blotting-paper method. Some of the models were sectioned at appropriate planes to facilitate a more detailed study of parts. In a number of instances the nasal fossæ were also reconstructed, in order to aid in a better understanding of certain developmental stages. Through the kindness of Mrs. Gage, who had previously modeled a 21-day human embryo, I had the privilege of studying this region at this early stage of development.

The ages of all the human embryos studied were determined by the Mall-method (Catalogue of the collection of human embryos in the anatomical laboratory of the Johns Hopkins University, Baltimore, 1904).

I wish to take this opportunity for expressing grateful acknowledgment to Professors Kerr, Kinsbury, and Tinker for helpful suggestions. I also wish to express my appreciation of the abundant material and other facilities placed at my disposal by the departments of anatomy, and embryology and histology. To Professor and Mrs. Gage, for many courtesies extended during this piece of research, I wish to express thanks.

II. The Formation of the Nasal Fossae.

THE NASAL ANLAGE.

The nasal anlage apparently establishes itself about the third week of embryonal life as localized thickenings of the ectoderm. Kallius and Mihalkovics place the earliest trace of the nasal anlage at the beginning of the third week, and Bryce at the end of the third week of embryonal life. Mrs. Gage refers to the nasal epithelium in a "three weeks human embryo."

These thickened ectodermal or nasal areas are situated on both sides of the outer surface of the wall of the fore-brain, just superior to the primitive oral fossa. Whether the nasal areas of the human embryo are at first connected, and later undergo division into two distinctly separate halves, is not definitely known. The H-shaped nasal area of Mrs. Gage's 21-day embryo seems significant. She figures two lateral plates connected by an intervening bar of apparently similarly thickened ectoderm. Minot says: "It is possible that more exact observation will show that in all vertebrates there is at first a single plate, which is early divided." Doubtless this will remain a mooted point in man until a sufficient number of human embryos of the proper age fall into the hands of different observers.

Bedford found the thickness of the olfactory areas in swine embryos of 5 mm. length to be 0.075 mm. Kallius found that, while the general ectodermal thickness was 0.01 mm., the thickened nasal areas measured from 0.044 to 0.060 mm.

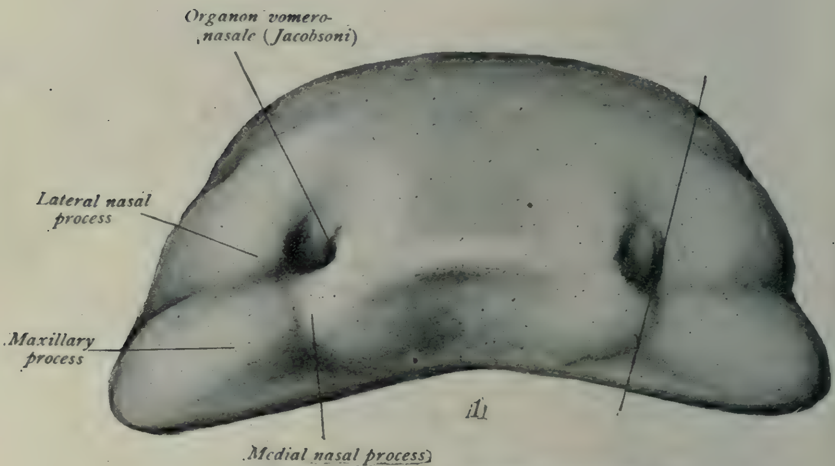
THE NASAL PITS.

During the fourth week the nasal areas become depressed—according to Mihalkovics at the end of the third week. This depression is not due to an invagination of the nasal areas, but it is passive and is caused by an increase in the thickness of the surrounding mesenchyma. These ridges of thickened mesenchyma around the nasal areas push the ectoderm into relief. In this manner each nasal area becomes surrounded by a fold, and is thus passively depressed. The folds are not complete, but are deficient inferiorly, and the thickening is most marked medially and laterally. The comparatively excessive medial and lateral thickening is thought by Kallius to be in anticipation of the later medial and lateral nasal processes. The nasal plates or areas thus become the olfactory or nasal pits, separated by a broad mass of tissue—the fronto-nasal process or the Stirnfortsatz of German embryologists.

The pits are primitively more or less pyriform in shape. The clubbed ends are directed somewhat medially and towards the vertex of the head, and the inferior extremities are directed somewhat laterally and towards the primitive oral fossa—the stomodæum. As the pits deepen they seem to separate the inferior portion of the fronto-nasal process on both sides into medial and lateral parts—the anlages of the medial and the lateral nasal processes. During the latter part of the fourth week, or early in the fifth week, the median portion of the fronto-nasal process undergoes further differentiation into a median or unpaired part, and two lateral or paired parts. The latter are globe-like and will be spoken of as the medial nasal processes (Processi globulares, His), and they form the immediate medial boundaries of the nasal pits. At the same time the lateral portions of the fronto-nasal projection grow caudally and form the lateral nasal processes—the immediate lateral boundaries of the nasal pits, or the primitive lateral nasal walls.

Up to this time the nasal pits are not closed in inferiorly, but communicate freely with the primitive oral fossa. In other words, the nasal pits and the oral fossa represent in a sense a common cavity. At this stage of development the maxillary processes of the first or mandibular arches grow ventrally and medially and abut—later fuse—with the medial nasal processes (Processi globulares). This fusion closes in the superior boundary of the primitive oral cleft, and at the same time shuts off the path of communication between the nasal pits and the oral cavity, i. e., the nasal pits are closed in inferiorly (figs. 1 and 3). The coalescence of the maxillary processes with the medial nasal processes forms the primitive inferior boundaries of the nasal pits; subsequently, however, the later extensions of the lateral nasal processes, medially and ventrally above the maxillary processes, meet and fuse with the medial nasal processes, to form the immediate inferior boundaries of the nasal pits (fig. 1). His has also pointed out, in case of arrested development in this region, that at times the lateral and medial nasal processes fuse, but that the maxillary process, on one or both sides, remains short and does not develop sufficiently to fuse with the medial nasal process as it normally does. In such cases the nasal pits are closed in below and are separated from the oral cavity, yet clefts exist between the medial nasal and the maxillary processes.

Fusion also takes place laterally between the maxillary and lateral nasal processes. Along the floor of the now rudimentary naso-optic furrow, a bud-like thickening of the rete



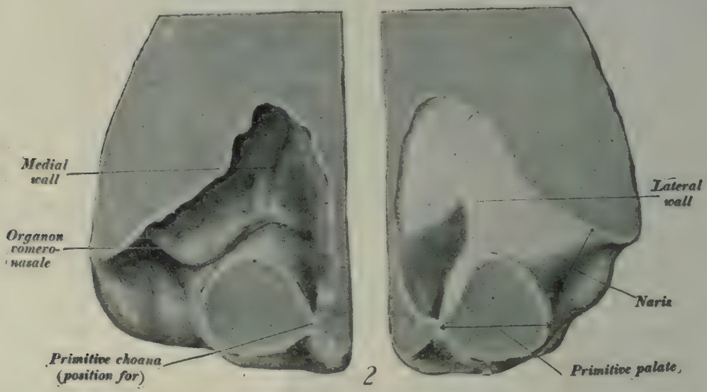
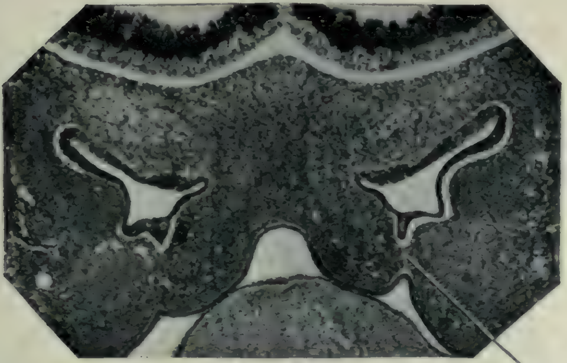


Fig. 1 (× 30) Drawing of a reconstruction of portion of the head of an embryo aged approximately 35 days (Human embryo, No. 6, Cornell University series, slides 50-57 inclusive). The figure represents a caudo-ventral view of the reconstruction.

Note the wide separation of the nasal fossae at this time, and that the fossae do not communicate with the mouth cavity. The maxillary and the medial nasal processes have fused, thus shutting off the nasal pits from the mouth cavity. The lateral nasal processes have not yet fused with the medial nasal processes. The external nose has not yet taken on any definite shape. Note the points for the primitive choanae and the extent of the primitive palate.

Fig. 2 (× 45) Drawing of a reconstruction of the left nasal fossa. The reconstruction is from the same embryo as that in fig. 1, and the plane of section is indicated by the line drawn over the left nasal fossa in fig. 1. Note the very simple lateral nasal wall at this stage of development and compare it with the medial wall. In a short time the lateral wall becomes much more complex and the medial wall relatively less so.



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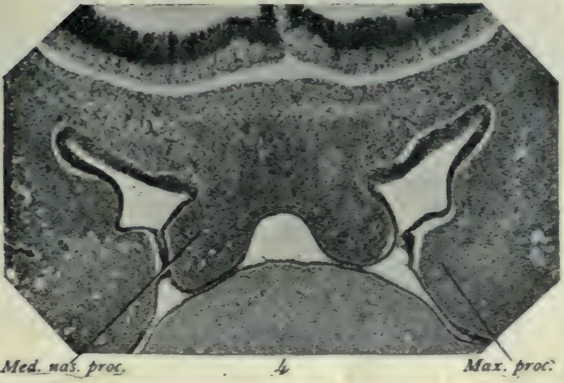

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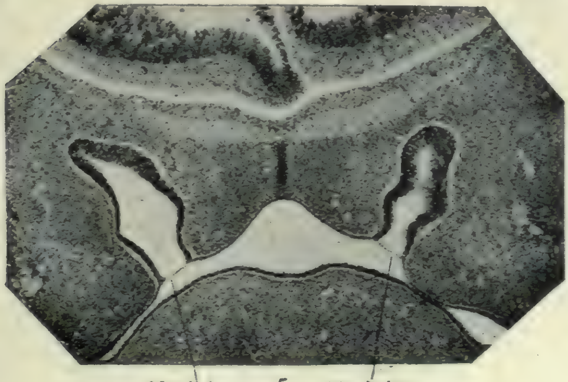

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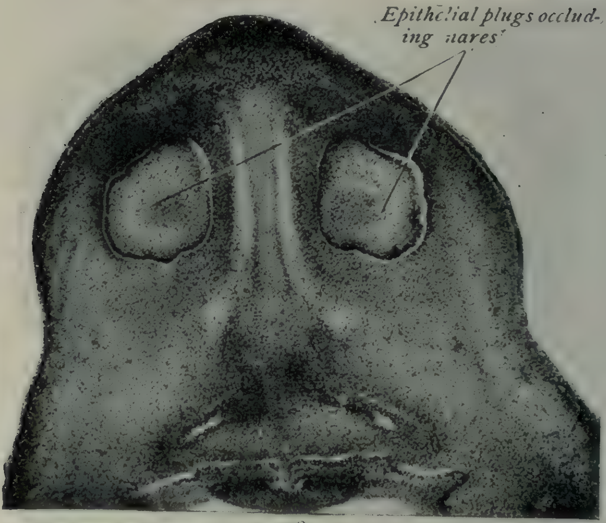


6

EXPLANATION OF FIGURES.

Figs. 3, 4, 5 (33.2) Photomicrographs of frontal sections through the head of an embryo aged approximately 35 days (Human embryo, No. 26, Cornell University series, slides 19 and 20). The sections are in the region of the primitive nasal fossae. Section fig. 3 is the most ventral and section fig. 5 the most dorsal of the three.

Fig. 3. Note that in the region of the coalescence of the medial nasal and the maxillary processes there is no intervening ectoderm. Fusion is complete and absolute, in that the mesenchymal tissue of the maxillary and medial nasal processes is continuous.

Fig. 4. Note the ectodermal strands between the medial nasal and the maxillary processes; the mesenchymal tissue of these processes is not continuous. Compare this condition with fig. 3.

Fig. 5. On both sides the two layers of epithelium, oral and nasal, have become attenuated and thinned out to represent single layers of cells. These are the bucconasal membranes which ultimately rupture to establish the primitive choanae.

Fusion, = coalescence between the maxillary and the medial nasal processes; Med. nas. proc., = medial nasal process; Max. proc., = maxillary process; Memb. buc., = membrana bucconasalis.

Fig. 6 (× 18) Photomicrograph of a frontal section through the ventral portion of the nose of an embryo aged approximately 49 days (Human embryo, No. 28, Cornell University series, slide 40).

Shows the epithelial plugs occluding the nares. This is a rather common condition during the latter part of the second month and throughout the third month. It also occurs after this period, as I have seen it in a 120-day embryo.

mucosum of the epidermis establishes the anlage of the nasolacrimal passages. These passages will again be referred to in connection with their apertures on the lateral nasal walls. The nasolacrimal ducts usually establish communications with the inferior nasal meatuses at about term. This may, however, be longer delayed.

For some time the lines of fusion of the maxillary and the lateral nasal processes with the medial nasal processes are represented by strands of ectodermal tissue. These ectodermal fusion-lines soon disappear ventrally and are replaced by indifferent mesenchyme, i. e., the mesenchymal tissue of the maxillary and the lateral nasal processes becomes continuous with that of the medial nasal processes. Fusion in this manner becomes permanent and absolute (fig. 3). Farther dorsally the ectodermal tissue does not wholly disappear, but strands of the latter tissue remain between the abutting processes. In these positions the primitive choanæ ultimately become established (figs. 2 and 4).

THE PRIMITIVE NASAL FOSSAE.

By this time (35-day embryo) the nasal pits have deepened dorsally, and more or less superiorly and inferiorly. The olfactory organ is now represented by two blind pouches lying in the mesenchymal tissue above the oral cavity. The pits have now developed sufficiently so that they may be termed the primitive nasal fossæ. The fossæ communicate freely with the exterior by means of the nares, but, in the absence of choanæ, they end blindly at their dorsal and inferior terminations (fig. 2). They are rather widely separated at this time (fig. 1). A reference to fig. 2 will show both the lateral and medial walls of the left nasal fossa of a 35-day embryo. It will be noticed that the lateral wall is extremely simple, presenting merely a plane surface. The medial or septal wall is slightly grooved, and the groove overhung by a fold. This is the anlage of the organon vomeronasale (Jacobsoni). Note also that the fossa ends blindly and that there is no connection between the oral and the nasal fossa at this time. The point of the primitive choana (posterior naris) is nearly thinned out sufficiently to represent the membrana bucconasalis (fig. 5).

THE PRIMITIVE CHOANAE.

The dorsal extension of the blind pouches or primitive nasal fossæ continues until the ectoderm of the nasal fossæ meets the ectoderm of the oral fossa. We have now in these positions merely thin membranes composed of two layers of abutting epithelium—nasal and oral—separating the dorsal portions of the primitive nasal fossæ from the oral cavity. These membranes, which have been carefully studied and named by Hochstetter, the "Membranæ bucconasales" (fig. 5), become so attenuated and thinned out that they finally rupture. The membranes may rupture at the same time or each may rupture independently of its mate.

According to the embryos studied for the substance of this paper the bucconasal membranes rupture from the 35th to the 38th day of embryonal life. Sudler found connection between the oral and nasal fossæ in a 5-weeks embryo. Hochstetter found in an embryo of "11 mm. lang bei 9 mm. Kopflänge" that the nasal fossæ ended blindly dorsally, and in an embryo of "15.5 mm. Länge und 10 mm. Kopflänge," the bucconasal membranes were broken through. He, however, found that the membrane was rather excessive on one side, apparently indicating recent rupture. The approximate age of these embryos would be 33 and 39 days, respectively. Kölliker places the time of establishment of the primitive choanæ "in der zweiten Hälfte des zweiten Monates." The apparent discrepancy in the time at which the bucconasal membranes rupture is doubtless due to different methods of determining the age of embryos.

As a result of the rupture of the bucconasal membranes we have established two openings—the primitive choanæ (primitive Gaumenspalten, Dursy; innere Nasengänge, innere Nasenlöcher, Kölliker). There is thus established in man for a second time a communication between the oral and the nasal fossæ. The hitherto blindly ending nasal fossæ now communicate not only with the exterior by means of the nares, but also with the mouth cavity by means of the primitive choanæ.

EPITHELIAL PLUGS IN THE NARES.

When first formed the nares communicate freely with the exterior, but shortly afterwards, say about the fortieth day of embryonal life, the lumina of the nares in very many cases become filled in with epithelial plugs (figs. 6 and 7). This plugging, which is due to a proliferation of the epithelial cells, seems to take place some time after the fusion of the medial and lateral nasal processes. In some cases the plugging is absolute, and in others deviating passages through the plugs may be seen. Sometimes the plugs are more or less fenestrated. I find plugging rather frequent from the fortieth to the sixtieth day. I have, however, seen it in a 120-day embryo. The passages (nares) are apparently later opened by a shedding of the epithelial plugs rather than by a resorption of the cells—probably both factors are involved. As evidence of a shedding of the epithelial plugs we frequently find shreds of epithelial masses extruding from the nares.

THE PRIMITIVE PALATE.

With the formation of the primitive choanæ we have also established the primitive palate, i. e., the portion of the roof of the oral fossa extending from the primitive choanæ to the nares. This condition is, however, of short duration because the definitive palate soon begins to form, and the lateral walls of the nasal fossæ thus become limited inferiorly. In the formation of the definitive palate the nasal fossæ appropriate a considerable portion of the primitive oral cavity. This is readily understood when we recall the superior boundary of the primitive oral cavity dorsally. Ventrally the mouth cavity is bounded superiorly by the primitive palate, but dorsally the mouth cavity extends into the future nasal cavity until the formation of the definitive palate establishes a roof for the mouth cavity dorsally (figs. 8, 9, 11, 13, 14 and 15).

THE FORMATION OF THE DEFINITIVE PALATE.

A reference to figs. 10, 13, 14 and 15 will indicate the stages in the formation of the definitive palate, and the manner in which the lateral nasal wall becomes limited inferiorly. The first step in the production of the definitive palate is the appearance of the palatal ridges. These are more or less wedge-shaped processes which grow caudally and somewhat medially from the medial sides to the maxillary processes. The palatal processes appear from the forty-fifth to the forty-eighth day of embryonal life, and at first hang almost vertically towards the mouth cavity, on either side of the tongue (fig. 13). They extend from the line of union between the medial nasal and the maxillary processes, where they are continuous with the primitive palate, dorsally to the wall of the pharynx, where they are continuous with the palato-pharyngeal folds. The palatal processes limit the lateral walls of the cavum nasi inferiorly.

It will be noticed that the tongue is at first between the palatal processes, i. e., the processes extend below the level of the dorsum of the tongue (figs. 10 and 11). Soon the tongue sinks and comes to occupy a lower position in the mouth cavity. With this change of the tongue the palatal processes become rotated from an almost vertical and sagittal plane to a horizontal plane (compare figs. 13 and 14). The processes now shortly meet in the median plane above the tongue, and fuse from before backwards along the opposed edges. In this manner the separation of the nasal fossæ from the mouth cavity is made complete and permanent. However in the ventral portion of the palate, where the palatal processes do not come in contact with each other (due to the interposition of the tissue separating the primitive choanæ) the separation of the nasal cavity from the mouth cavity is not entirely complete. This is brought about by the medial nasal processes uniting and extending dorsally in the roof of the mouth cavity as the intermaxillary process. The latter process projects farthest dorsally in the median plane, and on its lateral borders it is met by the ventral ends of the palatal processes. At these contact points the incisive canals are formed, and the latter at times serve as a means of permanent communication between the oral and nasal cavities. The lumina of the incisive canals are, however, generally obliterated early in life.

THE PERMANENT CHOANAE AND THE PERMANENT NASAL FOSSAE.

Coincidently with these changes in the formation of the nasal fossæ, the primitive choanæ elongate and ultimately occupy their definitive position, and thus become the permanent or secondary choanæ. The changes in the formation of the permanent choanæ also aid materially in increasing the ventro-

EXPLANATION OF FIGURES.

Figs. 7 to 12 (× 10.5) Photomicrographs of frontal sections of the head of an embryo aged about 43 days (Human embryo, No. 3, Cornell University series, sections 406, 380, 365, 360, 350, 325).

Note the plugging of the nares in fig. 7, and that the conchal anlages have no cartilage in them at this age (figs. 8-11). The mesenchymal tissue is, however, already undergoing condensation in anticipation of cartilage in the regions of the nasal septum and the lateral nasal walls. Compare this condition or pre-cartilage stage with figs. 16 to 20, and with figs. 32 to 38. Note the relation of the tongue to the palatal processes in figs. 8 to 12.

The section shown in fig. 7 is the farthest ventral and that shown in fig. 12 the farthest dorsal in the series.

P. pal., = processus palatinus; Eth. fold, = ethmoidal fold; Max. fold, = maxillary fold.

Fig. 13 (16.6) Drawing of a reconstruction of the lateral wall of the nasal cavity of an embryo aged approximately 43 days (Human embryo, No. 3, Cornell University series, sections 300-420 inclusive).

Shows the vertical position of the palatal process at this time. The definitive palate is not yet formed. Note also the primitive concha inferior (Max. fold) and that it occupies the greater portion of the lateral wall at this early stage. The primitive ethmoidal fold (Eth. fold)—the anlage of the ethmoidal conchae—is very rudimentary at this time.

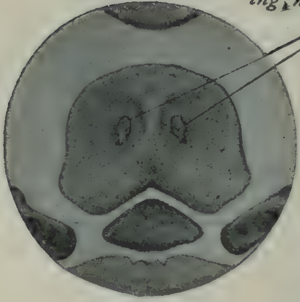
Eth. fold, = ethmoidal fold; Max. fold, = maxillary fold; P. pal., = palatal process.

Fig. 14 (× 16.6) Drawing of a reconstruction of the lateral wall of the nasal cavity of an embryo aged approximately 49 days (Human embryo, No. 28, Cornell University series, slides 40-51 inclusive).

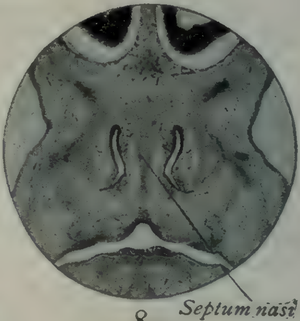
Compare horizontal position of the palatal process with the process in fig. 13. The ethmoidal region now has two folds well marked, and a rudimentary third presents in the superior and dorsal portion of the lateral wall. The concha nasalis inferior occupies comparatively less of the lateral wall. Ventrally it will be noticed that the reconstruction does not include all of the lateral wall. The ventral portion of the primitive palate is, therefore, not represented in the reconstruction.

Fig. 15 (× 6.6) Drawing of a reconstruction of portion of the right wall of the nasal cavity of an embryo aged about 105 days (Human embryo, No. 43, Cornell University series, slides 1-90 inclusive).

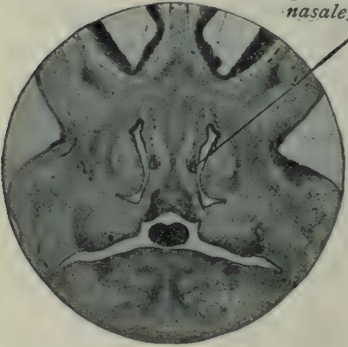
The definitive palate is completed and the choana has assumed the adult position. Compare this with figs. 2, 13, and 14. The ethmoidal region now presents four conchae, the highest of which is not yet well differentiated. Note the marked lobule in the region of the knee of the concha nasalis media.


Epithelial plugs occluding nares

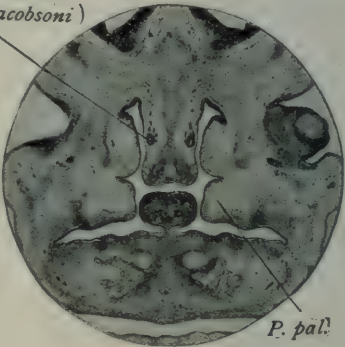
7


Septum nasi

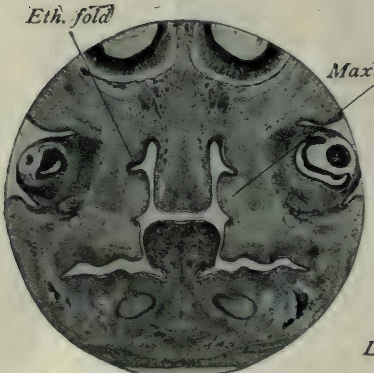
8


Organon vomeronasale (Jacobsoni)

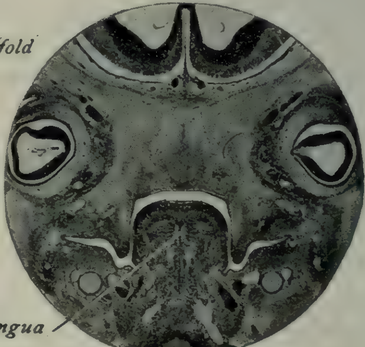
9


P. pal.

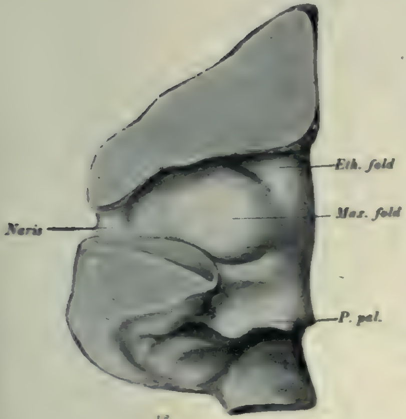
10


Eth. fold
Max. fold

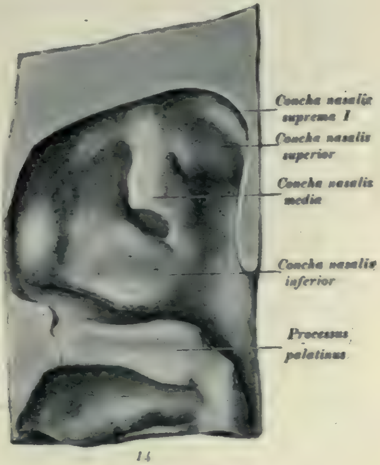
11


Lingua

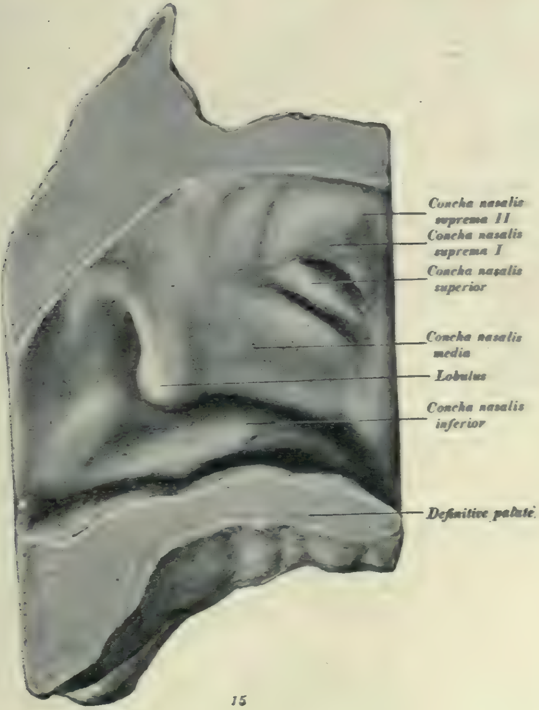
12


Eth. fold
Max. fold
Naris
P. pal.

13


Concha nasalis suprema I
Concha nasalis superior
Concha nasalis media
Concha nasalis inferior
Processus palatinus

14


Concha nasalis suprema II
Concha nasalis suprema I
Concha nasalis superior
Concha nasalis media
Lobulus
Concha nasalis inferior
Definitive palate

15

dorsal extent of the nasal cavity. The latter now begins to take on its adult form. The nasal septum which already has separated the nasal fossæ ventrally, rapidly fuses with the palate in the median plane, i. e., along the line of fusion of the palatal processes. In this manner the cavum nasi is divided into the nasal fossæ. This division takes place from before backwards.

Before the first appearance of the palatal processes as inferior boundaries of the nasal fossæ, the lateral walls of the fossæ have begun in a simple manner to form the complex configuration which characterizes the adult lateral nasal walls.

III. The Development of the Lateral Wall of the Cavum Nasi.

In the preceding paragraphs we considered the successive stages in the establishment of the nasal cavity, from the thickening of the ectoderm to form the nasal anlage, to the formation of the nasal fossæ. We noted the extreme simplicity of the lateral wall of the nasal cavity during the early stages of development. With these considerations on the various developmental stages of the nasal fossæ and the early condition of the lateral wall as a basis, we may now to better advantage follow in detail the stages in the formation of the various structures found on the lateral wall. We will, therefore, pass, in order, from the very simple lateral wall of the early embryo to the complexly configured wall of the term fetus.

THE FORMATION OF CONCHAL ANLAGES.

A reference to fig. 2 will indicate the extremely simple lateral wall of the nasal fossa of a 35-day embryo. It will be noticed that there is no evidence of the later complexity and configuration caused by the nasal conchæ, the nasal meatuses, the accessory conchæ and furrows, and the anlages of the paranasal chambers. In fact, the medial or septal wall is more complicated at this time than is the lateral wall—this standing in marked contrast to later conditions (compare figs. 2, 13, 14, and 21).

Some days later (38 to 40-day embryo) the inferior portion of the lateral wall immediately superior to the primitive palatal processes begins to bulge towards the lumen of the nasal fossa. In fact, this bulging for a brief time occupies nearly the whole of the vertical portion of the wall, and approximately the dorsal two-thirds. This fold represents the anlage of the concha nasalis inferior (maxilloturbinal) (fig. 13). Shortly after this (40 to 43 days) a second fold appears superior and somewhat dorsal to the first one. The former (ethmoidal fold) is placed in the superior and dorsal angle of the lateral wall. It seems also to extend up on the nasal septum at this point, and some of its prominence is really due to septal tissue. This fold is the anlage of the conchæ nasales ethmoidales, and in position and relations represents the concha nasalis media (Ethmoturbinale I, Peter; zweite Hauptmuschel, Killian; untere Siebbeinmuschel, Zuckerkandl; Basoturbinale, Schönemann). The fold of the agger nasi (nasoturbinal) can hardly be said to be in evidence at this early stage. It appears later, ventral and superior to the concha nasalis inferior, and ventral to the concha nasalis media.

VIEWS AS TO THE GENESIS OF THE PRIMITIVE NASAL FOLDS AND FURROWS.

From the above we gather that the lateral nasal wall is early thrown into ridges or folds, which are bordered by furrows or depressions. Just how these primitive folds (primitive conchæ) and furrows (primitive meatuses) of the lateral wall are formed is interpreted differently by various writers. While at first thought the views held seem widely divergent, they appear less so after we carefully analyze them. Some of the theories entertained are, however, without foundation.

It was at one time held by some observers that the folds were due to cartilaginous strands pushing the lateral nasal wall medially in the positions of the folds. This theory is, however, not tenable because the folds (primitive conchæ) are invariably present some time before cartilage is found in them. Only later does some of the indifferent mesenchyma contained in the folds change into cartilage; therefore it can have no connection whatever with the establishment of the primitive folds (conchæ).

Legal and Schönemann think that the folds are elevations left by excavations of furrows on the lateral nasal wall. Legal in offering this explanation especially referred to the inferior nasal concha. Later Schönemann concludes "das nicht die Legalsche Angabe über die Bildung der unteren Muschel völlig zu Recht besteht, sondern dass auch für die sämtlichen anderen Muscheln ein ähnlicher Bildungsmodus angenommen werden muss."

Mihalkovics, according to Schönemann, holds that the folds are at first "frei vorwachsende Duplikaturen der Schleimhaut." Glas, who investigated this field in rats, comes to the following conclusion: "Der Bildungsmodus der Muscheln ist die Resultierende zweier Komponenten: (1) des Auswachsens in die Wandpartien einwachsender Epithelleisten (Fissuren), (2) des Vorwachsens-bestimmter Wandpartien."

After a study of these early conditions I am led to believe that the first change in the lateral nasal wall from a more or less even surface (fig. 2) is the production of very shallow grooves; the latter appearing inferior and superior to the position of the primitive concha inferior. These shallow grooves at once throw into slight relief the greater portion of the lateral nasal wall—the anlage of the concha nasalis inferior (maxilloturbinal). I believe that the mesenchymal tissue contained within this primitive fold almost simultaneously undergoes proliferation, thus aiding in early making the fold more prominent. The mucous membrane over the fold may also become thickened, but according to my observations this thickening for the primitive concha inferior is slight. I cannot agree that the formation of a well marked maxillary fold or primitive concha nasalis inferior is wholly due to the formation and deepening of the bordering furrows, but, as stated before, I believe that the formation of very shallow grooves is the primitive step in conchal formation. The proliferation of the mesenchyma (probably also the mucous membrane to some extent) aids materially in causing the primitive concha inferior to bulge into the lumen of the nasal fossa, and the bordering furrows to become passively deeper (figs. 10 and 11).

The ethmoidal fold appears next in the extreme dorsal and superior portion of the nasal fossa, in the angle formed by the lateral wall and the nasal septum in this position (figs. 11 and 13). Since the primitive concha inferior (maxillary fold) takes up the greater portion of the lateral wall at this time there is little room for the primitive ethmoidal fold (fig. 13). For this reason the latter fold arises in part from the septum. Later the nasal fossa increases in the dorsosuperior direction, and with this the primitive ethmoidal fold passively migrates from the septum. The mucous membrane over the ethmoidal fold is as a rule thickened, and this thickening causes the primitive fold to show up well in frontal sections (fig. 11). This, however, does not detract from the statement that the groove between the ethmoidal and maxillary folds is present, at least to some extent, before the folds have gained any appreciable bulging. Later we have a proliferation of the mesenchyma and a deepening of the furrow (primitive meatus nasi medius) inferior to it, hence the ethmoidal fold becomes

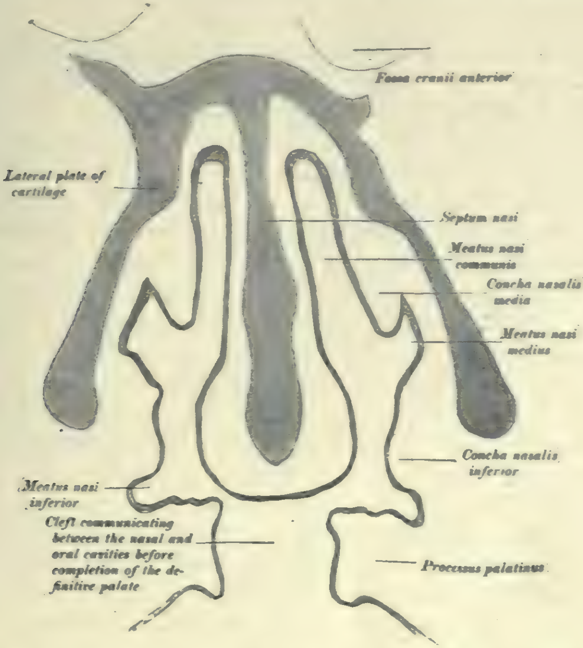


Fig. 16 (× 26.6) Outline drawing of a frontal section of the nasal cavity of an embryo aged approximately 49 days (Human embryo, No. 28, Cornell University series, slide 48). The nasal and oral cavities are in communication with each other at this point, i. e., the palatal processes have not as yet coalesced in the median plane in the formation of the definitive palate. Note also the simple lateral wall of the middle nasal meatus—compare with fig. 18.

more prominent. Gradually in place of the single ethmoidal fold we have, with the increase of the nasal fossa in the dorso-superior direction, the establishment of anlages of the individual ethmoidal conchæ—this, as a rule, taking place in order from the most caudal to the most cephalic ethmoidal concha (figs. 13, 14, 15, and 21).

As may be inferred from the above, the ethmoidal region on each side presents but for a brief time a single fold (fig. 13). As the nasal fossa enlarges superiorly and dorsally there is a differentiation in this region into two folds (fig. 14)—this change occurring approximately from the forty-eighth to the fiftieth day of fetal life. A later stage, 95 to 100 days, shows three well-formed ethmoidal conchæ (fig. 15). By the fourth month of fetal life the conchal field shows from three to four ethmoidal conchæ, besides the concha inferior. Fetuses from the seventh month to term will, if carefully examined, show from three to five ethmoidal conchæ (figs 21 and 30). Of course in each case a corresponding number of furrows or meatuses are established—some of the meatuses, however, being very rudimentary. After birth the ethmoidal conchæ and meatuses become reduced in number. This reduction is not carried so far in some cases as in others—thus accounting for the supernumerary or additional conchæ and meatuses of many adult noses. Doubtless the number of ethmoidal conchæ that are differentiated before birth have an important bearing on the number of conchæ that may be present in an individual case—this is probably just as important a factor in determining the number of adult ethmoidal conchæ as is the retrogressive change of reduction.

THE EARLY CHANGES IN THE MEATUS NASI MEDIUS.

Thus far only the superficial aspects of the lateral nasal wall, with especial reference to the development of folds and furrows (conchæ and meatuses), have been considered. The general plan of these conchæ and meatuses will be considered in detail in subsequent paragraphs. If now we return to a 40- to 50-day embryo and examine the portion of the middle meatus operculated by the middle nasal concha, we will notice that the lateral wall of this meatus is perfectly even (fig. 16). This study is best made by an examination of serial frontal sections through this region of the nose. This same region in an embryo aged from 58 to 60 days will indicate the beginning formation of the complicated nature of the meatus nasi medius—the most complex of all the meatuses. This change in the middle meatus is heralded by the appearance of a somewhat crescentic-shaped fold of mesenchyme and mucous membrane, set off by a slightly earlier grooving immediately superior to the fold. The latter has its free and rather sharp border directed superiorly and dorsally, and is the anlage of the processus uncinatus. The furrow immediately superior to the fold is the primitive infundibulum ethmoidale (fig. 18). It will be noticed that the furrow communicates rather freely with the meatus nasi medius through a rather widely open cleft—the hiatus semilunaris.

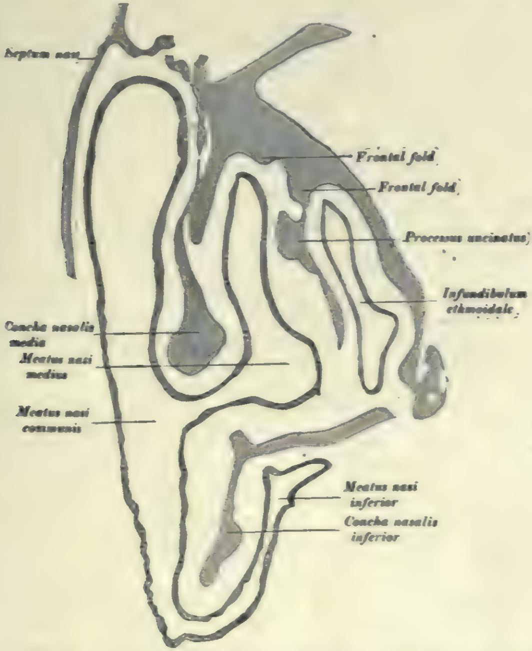


Fig. 17 (× 10) Outline drawing of a frontal section through the nose of an embryo aged 120 days (Human embryo, No. 42, Cornell University series, slide 29).

At this plane of section the processus uncinatus is fused with a frontal fold, and the infundibulum ethmoidale ends blindly. Compare this figure with fig. 18. In the latter figure the plane of section is farther dorsal.

If now we examine a frontal section of a somewhat later embryo we will notice that the infundibulum ethmoidale early tends to develop beyond its primitive limits, and to pouch towards the ventral and superior portion of the meatus nasi medius, here ending blindly. This early, blind, ventral and superior extension of the infundibulum ethmoidale has been erroneously considered by some writers as the primitive sinus maxillaris (fig. 32). Of the bulla ethmoidalis there is nothing to be seen at this time.

About the seventieth day there is a slight, sometimes a comparatively extensive, pouching or evagination of the mucous membrane from the depth of the infundibulum ethmoidale—thus establishing the anlage of the sinus maxillaris. Shortly after this we have the first evidences of the bulla ethmoidalis appearing superior and lateral to the processus uncinatus—this in the form of very low accessory folds or conchæ. By the beginning of the fourth month of fetal life the folds of the bulla are fairly well formed. At the end of the fourth month the folds with the bordering accessory furrows are in many cases well outlined (fig. 18). From some of the accessory furrows the so-called middle group of ethmoidal cells develop, and in a sense the former are the anlages of the latter structures. At a comparatively early stage we have evidences of a beginning extension of the middle meatus in a ventral and superior direction. This is the anlage of the recess, which Killian in later fetuses terms the "Recessus frontalis" and it is in reality the first step in the formation of the sinus frontalis and the most ventral of the anterior group of ethmoidal cells. The accessory folds and furrows, and the frontal recess of the middle meatus will be considered in detail in a subsequent portion of this paper.

THE EARLY CHANGES IN THE MEATUS NASI SUPERIOR.

With the appearance of the accessory folds (conchæ) and the frontal recess of the middle meatus, we have the establishment, in very many cases, of the anlage of an accessory fold (concha) on the lateral wall of the superior meatus. This fold early tends to form very shallow recesses superior and inferior to it, and occasionally it has been mistaken for the superior nasal concha (fig. 19). From the superior and inferior recesses, and from the ventral and superior extremity of the superior meatus, most of the posterior group of ethmoidal cells develop—a matter which will be taken up subsequently. Frequently a posterior ethmoid cell develops from the meatus nasi suprema I. The latter meatus, however, is present in only 62.5 per cent of my adult specimens.

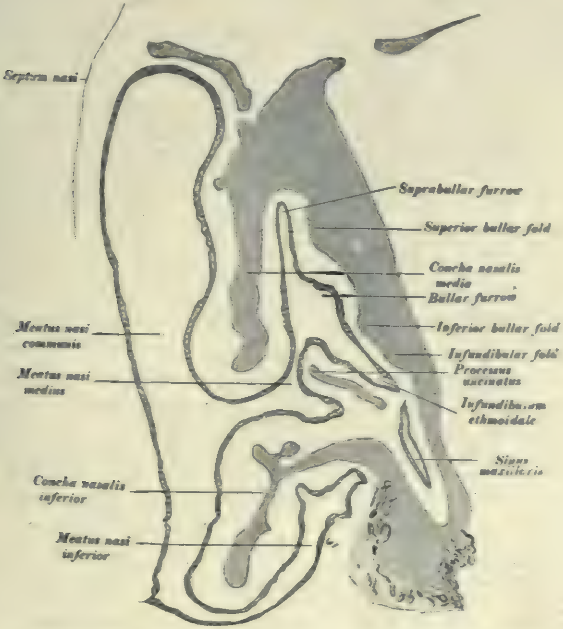


Fig. 18 (× 10) Outline drawing of a frontal section through the nose of the same embryo as that in fig. 17. The plane of section in this figure (slide 40) is farther dorsal, and is in the region of the bullar folds.

The processus uncinatus projects free at this plane of section, and the infundibulum ethmoidale communicates rather freely with the meatus nasi medius. The cartilage of the processus uncinatus is not continuous with the cartilage of the lateral plate at this level—compare this with the cartilage of the processus uncinatus in fig. 17.

THE EARLY CHANGES IN THE SUPERIOR AND DORSAL PORTION OF THE NASAL FOSSAE.

A frontal section through the dorsal portion of the nasal cavity in a three-months embryo will already indicate the manner of constriction of a portion of the dorsal and superior part of the nasal fossæ in the formation of the early anlages of the sinus sphenoidales. In a 120-day embryo the sphenoidal sinus anlages are well advanced, but have not reached, or at least not extended into, the body of the developing sphenoid bone. The lateral nasal plates of cartilage more or less overhang the sphenoidal-sinus anlages (fig. 20).

THE NUMBER OF ETHMOIDAL CONCHAE AND MEATUSES THAT ARE DIFFERENTIATED BEFORE BIRTH.

As to the number of ethmoidal conchæ and meatuses that are differentiated during the latter months of intrauterine life conflicting opinions are held. The meatus inferior and the concha inferior are constant, hence they will not be considered in the present connection.

Zuckerkandl states that three and at the highest four ethmoidal meatuses are formed (including the meatus medius). This would indicate three and at the highest four ethmoidal conchæ. In reference to the latter he says: "Drei Siebbeinmuscheln repräsentieren . . . die typische Faltungsweise des Siebbeines." Killian, whose researches on this point are extensive, states that in fetuses of the ninth to the tenth month, five and even six ethmoidal meatuses (Hauptfurchen) are present. He also finds a corresponding number of ethmoidal conchæ (Hauptmuscheln), but includes among the number, as his "erste Hauptmuschel," the agger nasi (nasoturbinal) plus the processus uncinatus. Killian comes to the following conclusion: "Mit dem, was das aufmerksame Studium meiner Prepärate ergiebt, stimmen die Beobachtungen an meiner ganzen Material überein, wobei ich bemerke, dass die erste, zweite und dritte Hauptfurchen fast regelmässig vorkommen und dass die vierte in über 30 Fällen, die fünfte und sechste in noch einigen weiteren Beispielen vertreten sind." Kallius holds that seldom are all six furrows differentiated. Mihalkovics says that "Knorpelige Muscheln sind beim Menschen im embryonalen Leben stets 4 vorhanden, oft auch 5." The latter, however, includes among this number the concha nasalis inferior, which has not been done by the other writers mentioned, since they considered the ethmoidal region only.

After an extended study of the ethmoidal region in fetuses, I find that there is more or less uniformity up to the fourth month. However, during the latter half of fetal life there is indeed great variation in the number and form of the ethmoidal conchæ and meatuses. Notwithstanding this I think that careful analyses indicate a general plan more or less common to most ethmoidal regions—some specimens differing here and others there from the plan. Occasionally some specimens differ so markedly from this general plan that they are difficult of comparison.

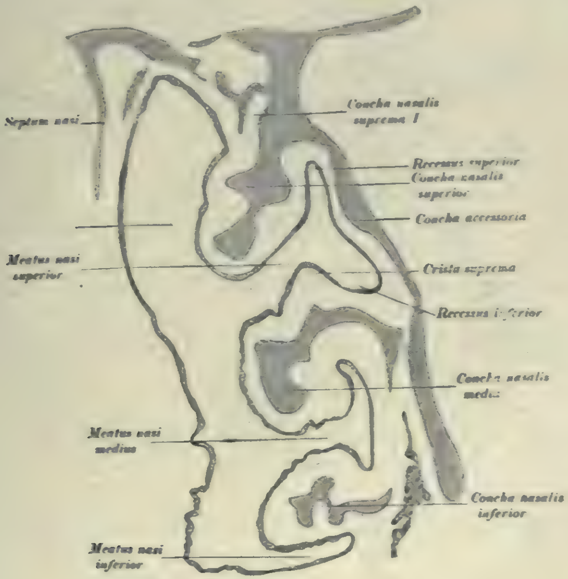


Fig. 19 (× 10) Outline drawing of a frontal section through the nose of the same embryo as those in figs. 17 and 18. This section (slide 67) is in the region of the accessory concha of the meatus nasi superior, hence is farther dorsal than that in fig. 17.

Shows how the crista suprema of the concha media aids in forming the recessus inferior of the meatus superior. Compare the meatus superior of this section with the meatus medius of section, fig. 18.

Doubtless the personal equation is quite a factor in determining the number of ethmoidal conchæ. In many cases some of the conchæ are so rudimentary that one observer might not consider the under-developed folds as individual conchæ, yet another observer would include them among the number.

I find by careful study of the ethmoidal region in a series of specimens from late fetuses that five ethmoidal conchæ are not uncommon; however, the most superior and dorsal conchæ may be but faintly outlined. We occasionally find all five conchæ well marked (fig. 21). In this respect my observations agree with those of Killian—he giving six as his highest number of ethmoidal conchæ. The apparent discrepancy in number is due to the fact that he (Killian) names the agger nasi (nasoturbinal) plus the processus uncinatus as his "erste Hauptmuschel." On the other hand, I do not do this, but consider his "zweite Hauptmuschel" as my concha nasalis media. I find four ethmoidal conchæ very frequent indeed, in fact, fully 65 per cent of later fetuses, according to my series of specimens, present four (fig. 26). It must, however, be remembered that some of the conchæ or folds are extremely rudimentary, nevertheless they must be taken into consideration when analyzing the ethmoidal region. Occasionally some specimens show a low degree of differentiation and possess but three ethmoidal conchæ (fig. 28).

It is indeed difficult to say whether in the latter cases the progressive changes (differentiation) have not been carried so far as in some others, or whether retrogressive changes (coalescence of two or more conchæ with obliteration of the intervening furrows) took place at an earlier time. The latter is doubtless an active process after birth, because we rarely find more than three ethmoidal conchæ in the adult. It is, therefore, quite possible that retrogressive changes are instituted much earlier in some cases, and that the ethmoidal regions which have a comparatively small number of conchæ in the late fetus, originally possessed a larger number of folds. I, however, believe that in the majority of these cases the differentiation in the ethmoidal region is not carried so far as in some others, hence a smaller number of ethmoidal conchæ.

Whatever the number of ethmoidal conchæ may be, there is a corresponding number of meatuses or furrows; i. e., each concha more or less overhangs a furrow or meatus. This overhanging is especially marked in the meatus nasi medius. Killian gives six as his highest number of "Hauptfurchen"—this would place a meatus dorsal and superior to the most cephalic concha present. I, however, prefer to think of this region as belonging to the recessus sphenoethmoidalis. The latter because it corresponds to the position of the adult recessus sphenoethmoidalis; also that after birth we do not usually think of the meatus nasi as being superior to, but inferior to the corresponding conchæ nasales. The recessus sphenoethmoidalis, however, is very closely related to the meatus nasi suprema I, and in the absence of the latter with the meatus nasi superior.

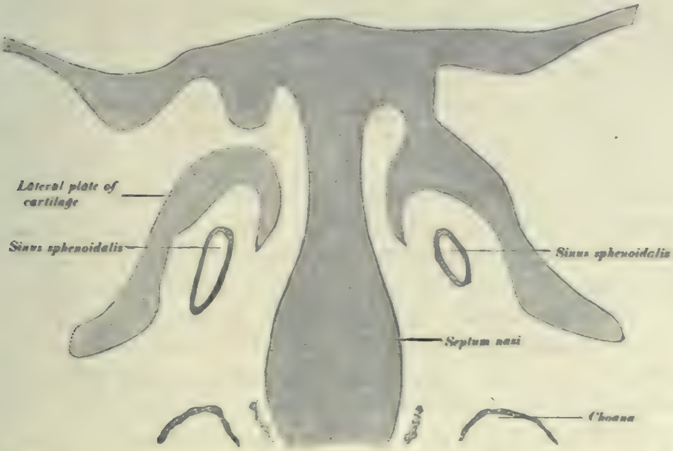


Fig. 20 (× 10) Outline drawing of a frontal section through the dorsal portion of the nasal cavity. The section (slide 91) is from the same embryo as are those represented in figs. 17, 18, 19. Note how the dorsal and superior portions of the nasal fossae establish the anlages of the sinus sphenoidales.

ETHMOIDAL NOMENCLATURE.

Owing to the comparatively large number of ethmoidal conchæ and meatuses present in the nose of the late fetus in comparison to adult conditions, it will be necessary for the sake of description to adopt some nomenclature sufficiently extensive to cover the extreme cases one meets at this time.

Zuckerkandl's nomenclature is not extensive enough to cover the fetal field in all cases. He designates the ethmoidal conchæ as "untere, mittlere, obere, und vierte (oberste) Siebbeinmuscheln." He speaks of the ethmoidal meatuses as "inferior, superior, und suprema Fissuræ ethmoidales." He, however, complicates his nomenclature by his views on the "vierte (oberste) Siebbeinmuschel." He makes the following statements:

"In 6.7 Percent der Fälle tritt bei Kindern und Embryonen noch eine vierte Siebbeinmuschel auf, die sich zwischen die mittlere und obere Concha ethmoidalis einschiebt. . . Vierte Siebbeinmuschel (Concha suprema), begrenzt: unten von der Fissura ethmoidalis suprema, oben von der Siebplatte."

There is doubtless a discrepancy in the above statements. If the "vierte (oberste) Siebbeinmuschel" inserts itself ("einschiebt") between the "mittlere und obere Concha ethmoidalis," then the furrows or meatuses that border it are his (Zuckerkandl's) "superior und suprema Fissuræ ethmoidales," and the "obere Siebbeinmuschel" would be between his "Fissura ethmoidalis suprema" and the "Siebplatte." The reader will at once notice the difficulty encountered in attempting to compare this with other nomenclatures.

Killian adopts a nomenclature to cover, according to my specimens, all cases, by naming the ethmoidal meatuses, including the meatus medius, "Hauptfurchen 1-6;" and the ethmoidal conchæ, "Hauptmuscheln 1-6." He, however, includes among his "Hauptmuscheln" the agger nasi (nasoturbinal) plus the processus uncinatus as his "erste Hauptmuschel," which has not been done in this paper.

Peter also covers the field by designating the ethmoidal conchæ "Ethmoturbinalia 1-5." The latter does not include Killian's "erste Hauptmuschel" among this number.

Schönemann speaks of the concha media as the "Basoturbinale," and Paulli in an exhaustive study refers to all the major nasal conchæ as "Endoturbinalien," in contradistinction to the accessory conchæ, which he designates as "Ektoturbinalien."

The general text-books of anatomy, also the BNA (nomina anatomica, Basel), offer nomenclatures sufficient for practically all adult conditions, but not for the late fetal stage. In order not to depart too far from the general texts on anatomy and the BNA, yet offer for late fetal conditions a sufficiently comprehensive nomenclature, I will in subsequent paragraphs use the following names for the several nasal conchæ and meatuses.

The nomenclature offered is not necessary for all cases, nevertheless it is essential to have a terminology that covers not only the adult, but also the extreme fetal conditions one frequently meets.

Nomenclature used in this paper:

Meatus nasi.	Conchæ nasales.
Meatus nasi inferior,	Concha nasalis inferior,
Meatus nasi medius,	Concha nasalis media,
Meatus nasi superior,	Concha nasalis superior,
Meatus nasi suprema I,	Concha nasalis suprema I,
Meatus nasi suprema II,	Concha nasalis suprema II,
Meatus nasi suprema III.	Concha nasalis suprema III.

THE NASAL MEATUSES AND CONCHAE AS SEEN DURING THE LATTER STAGES OF INTRAUTERINE LIFE.

The nasal meatuses and conchæ of the fetus of the latter half of intrauterine life may now be considered in detail. The ethmoidal region is rather complex in construction, and with the accessory folds (conchæ) and furrows, the anlages of the paranasal chambers, and the conchæ and meatuses, offers an interesting field for study from the second month on to term. The meatuses will be taken up first for detailed study, followed by the nasal conchæ. After this the accessory folds (conchae) and the accessory furrows of the meatuses will be considered; finally the anlages of the paranasal chambers.

THE NASAL MEATUSES.

The meatus nasi inferior. The meatus nasi inferior is one of the first meatuses to become well established. It is primitively formed between the anlage of the concha inferior and the primitive processus palatinus. Later, with the fusion of the two palatal processes in the median plane to form the definitive palate, the meatus inferior comes to occupy the position between the concha inferior and the floor of the nasal fossa. The ductus nasolacrimalis connects with the meatus inferior approximately at term. A reference to fig. 37 will, however, show a frontal section of the left nasal fossa of a term fetus in which the barrier between the meatus inferior and the ductus nasolacrimalis is still intact, i. e., the duct has not acquired a lumen in the region of the meatus inferior. Finally there are two layers of abutting epithelium, one nasal and the other that of the duct, forming the barrier. The membrane now seems to thin out and to become attenuated, ultimately rupturing; in other words the duct becomes patent at this point. This attenuation of two layers of abutting epithelium, ultimately resulting in rupture, in order that communication between two cavities may be established, reminds one somewhat of the attenuation and rupture of the membrana bucconasalis.

The meatus nasi inferior is otherwise simple and offers no conditions that warrant a further consideration at this time.

The meatus nasi medius, superior, suprema I, suprema II, suprema III. The ethmoidal meatuses, including the meatus medius—since they have many things in common—may for the time be considered together. It must be recalled that in many cases the meatus suprema I, II, and III are extremely rudimentary and are merely very shallow, short grooves. Again in many instances the meatus nasi suprema II and III are not at all differentiated. The meatus nasi suprema I is the most constant of the supreme meatuses. While we must follow some general type for the sake of description, it does not necessarily indicate that all specimens agree in their entirety.

The ethmoidal meatuses all converge at their inferior and dorsal extremities in the region of the angle formed by the junction of the ventral and inferior surfaces of the body of the sphenoid bone (fig. 21). These meatuses in a general way possess knees or bends, thus presenting ascending and descending rami. These bends are best marked in the middle and superior meatuses. It is a constant condition in the middle meatus, and a fairly large number of specimens show a well marked ascending ramus for the superior meatus. The remaining meatuses when present, however, do not have well marked ascending rami. In fact, very many specimens give no evidence whatever of individual ascending rami for the meatus suprema I, II, and III (fig. 23). In a general way it may be stated that the differentiation of ascending rami becomes gradually less marked as we pass from the meatus medius to the meatus suprema III (figs. 21, 23, and 25).

The ascending rami. The ascending ramus of the middle meatus is directed rather obliquely, in a ventral and superior direction—this is less so for the corresponding ramus of the superior meatus. As we pass from the superior meatus to the supreme meatus III we find a rapid change in direction of the ascending rami to a more or less vertical plane, i. e., the ascending rami more nearly vertical to the cribriform plate of the ethmoid bone. We may, therefore, say—when ascending rami are differentiated—that as we proceed from the meatus medius to the meatus suprema III, there is a gradual change in direction of the ascending rami from an oblique to a more or less vertical plane (fig. 21).

In fig. 21 we have the representation of a specimen which presents an ascending ramus for each corresponding meatus. The ascending rami of the supreme meatuses, II and III are, however, not marked, in that the two latter meatuses seldom have well developed knees. In fig. 22 the ascending rami are indicated merely by very shallow, short grooves near the cribriform plate of the ethmoid bone. In the latter case in no instance does an ascending ramus reach the corresponding descending ramus. This doubtless means a lessened degree of differentiation into ethmoidal conchæ in the region of the ascending rami as compared with the corresponding region in fig. 21.

Sometimes there is apparently no attempt at the formation of individual conchæ in the region of the ascending rami, hence in these cases the meatuses—with the exception of the meatus medius—do not possess individual ascending rami (fig. 23). In other instances the meatus superior and medius have ascending rami, but the remaining ethmoidal meatuses do not (fig. 25). The ascending ramus of the meatus superior is occasionally so well developed that it reaches nearly to the cribriform plate of the ethmoid bone (fig. 24).

A reference to figs. 21 to 30 will indicate the irregularity and inconstancy of the ascending rami, with the single exception of the meatus medius. Notwithstanding this inconstancy of the ascending rami, we occasionally have ascending rami as well marked as the descending rami (fig. 24). Rarely we find them all fairly well marked (fig. 21), but in the vast majority of cases the ascending rami of the supreme meatuses vary from an extremely rudimentary state to a complete absence. The number of times the ascending rami are present in some form, however, justifies the division of the ethmoidal meatuses into ascending and descending portions.

The descending rami. The descending rami of the ethmoidal meatuses are as a rule much better differentiated than are the corresponding ascending rami. What has been said of the ascending rami, i. e., a gradual change from an oblique to a more or less vertical plane, as one passes from the meatus medius to the meatus suprema III, applies also; although with less degree, to the descending rami.

The descending ramus of the meatus medius lies practically in a horizontal plane, and the corresponding ramus of the meatus superior varies from it but little in its general direction (fig. 22). On the other hand, the descending rami of the meatus suprema I, II, and III assume a more vertical direction—the latter being most marked in the meatus suprema III (fig. 21). In very many cases the descending rami of the meatus suprema II and III are extremely rudimentary or not at all differentiated (fig. 29). The descending ramus of the meatus suprema I is present in some form, according to my specimens, in practically all cases. Of course after birth the meatus suprema I in many cases becomes obliterated (62.5 per cent of my adult specimens present a meatus suprema I) and in the adult the concha nasalis superior and suprema I are represented by the concha superior. The meatus medius and superior are, of course, constant in both the fetus and in the adult.

In a general way we may say that the integrity of the ethmoidal meatuses present, with the possible exceptions of the meatus medius and superior, depends practically wholly upon the differentiation and degree of development of the descending rami, and not upon the ascending rami (figs. 21 to 24).

THE NASAL CONCHAE.

The concha nasalis inferior. The concha nasalis inferior appears first in the formation of nasal conchæ, and for some time occupies the greater portion of the lateral nasal wall (fig. 13). It is at first not well differentiated, but with the growth of the fold and the deepening of the furrows (meatuses) inferior and superior to it, the concha becomes more sharply outlined. With the growth of the nasal fossa in the dorsal and superior direction, and the resulting development of the ethmoidal region, the concha inferior gradually comes to take on the usual adult form. During the latter stages of intrauterine life it offers nothing of note to justify a further consideration of it in this connection.

The agger nasi. The agger nasi is homologous with the nasoturbinal which is so well developed in some other forms (pig, cow, sheep, dog, skunk, etc.). It is extremely rudimentary in man in comparison, for example, to the corresponding structure in the pig, rabbit, cow, etc. The agger nasi is an elevation located ventral to the concha nasalis media, and ventral and superior to the concha nasalis inferior. It is more or less parallel to the bridge of the nose. It is at times fairly well developed in the late fetus, and again we find it extremely rudimentary (figs. 22, 25, 29, and 39).

Killian, in conjunction with the processus uncinatus of the ethmoid bone, considers it as an ethmoidal concha, i. e., belonging to the ethmoidal group of conchæ. He considers the processus uncinatus as the descending crus of the agger nasi, and speaks of the two structures as his "erste Hauptmuschel." In commenting on Killian's classification of the nasoturbinal (agger nasi), Peter, who studied the structure from a comparative point of view, says: "Killian und vor ihm Andere glaubten auch dass das Nasoturbinale in das Schema der Riechmuscheln einzwängen zu müssen und suchten daher nach einem Crus descendens desselben, den sie im Processus uncinatus gefunden zu haben meinten. Nach obiger Darstellung der Muschelentwicklung ist diese Forderung ebenso umberechtigt, wie sie für das Maxilloturbinale wäre."

I prefer to think of the processus uncinatus as an accessory concha, and to class it with the folds of the bulla ethmoidalis (also accessory conchæ of the middle meatus) and with the accessory concha of the superior meatus. While the processus uncinatus is more or less continuous with the agger nasi, and for descriptive purposes might be considered as the descending crus of the agger nasi, it is also in many instances fused ventrally and superiorly with the lateral surface of the concha nasalis media. I have also seen it fused across the infundibulum ethmoidale with the ventral extremity of the bulla ethmoidalis. In subsequent paragraphs I will consider the concha nasalis media as Killian's "zweite Hauptmuschel," and will not consider the agger nasi and the processus uncinatus as belonging to the regular group of ethmoidal conchæ.

The concha nasalis media, superior, suprema I, suprema II, suprema III. The regular group of ethmoidal conchæ have many things in common, hence may for the time be considered together. In a general way they all possess knees or bends, thus presenting superior and inferior, or better, ascending and descending portions (Cura ascendens and descendens of Killian). As we pass from the concha media to the concha suprema III, we find a gradual lessening in the degree of the knee or bend. The supreme conchæ represent practically straight angles, hence no well marked division into ascending and descending crura, i. e., the conchæ are practically straight. This is also aided in very many cases by the rudimentary development or complete absence of individual ascending crura (figs. 23 and 29). As we pass from the concha media towards the concha suprema III we find a gradual change in the plane of the conchæ, from a more or less oblique direction to a more or less vertical one (figs. 21 and 23).

The ascending crura. The ascending crura always tend more towards the perpendicular than do the corresponding descending crura. This is especially true of the concha media and superior, also at times of the concha suprema I (figs. 21 and 24). Fig. 21 shows five fairly well marked ascending crura. It will be noticed that they are almost perpendicular to the cribriform plate of the ethmoid bone. However, their superior extremities as individual conchæ do not closely approach this plate. We may either think of the conchæ as fused into one mass, or that differentiation into individual conchae stopped short of the cribriform plate. The tendency of the conchæ to become straighter as one proceeds from the concha media to the concha suprema III is well illustrated in this figure (21).

In other cases the individuality of the ascending crura is only faintly indicated by very shallow grooves throwing into slight relief extremely rudimentary crura. In fig. 22 we have such an example. Here we find the general ascending-crural mass well developed, but the differentiation into five ascending crura, with the single exception of the ascending crus of the concha media, only slightly marked. In some instances the ascending crus of the concha media stands out in bold relief. This is especially due to a well developed ascending ramus of the meatus superior (fig. 24). In the latter figure

EXPLANATION OF FIGURES.

Figs. 21, 22, 23 (× 1.2) Drawings of specimens of the lateral nasal wall from the anatomic series, Cornell University. The drawings all represent the lateral nasal wall of term fetuses.

Compare especially the regions of the ascending crura of the ethmoidal conchae in the three figures. In fig. 21 the ascending and the descending rami of the ethmoidal meatuses are continuous. In fig. 22, however, the very rudimentary ascending rami of the ethmoidal meatuses are not continuous with the descending rami—save in the meatus medius. It will be noticed in fig. 23 that there is no attempt at the differentiation of individual ascending crura for the ethmoidal conchae; the concha media is, however, an exception. In the latter figure the ascending crura are represented by a general ascending crural mass undifferentiated.

Note the extensive furrows on the medial surface of the concha nasalis media in figs. 21 and 22.

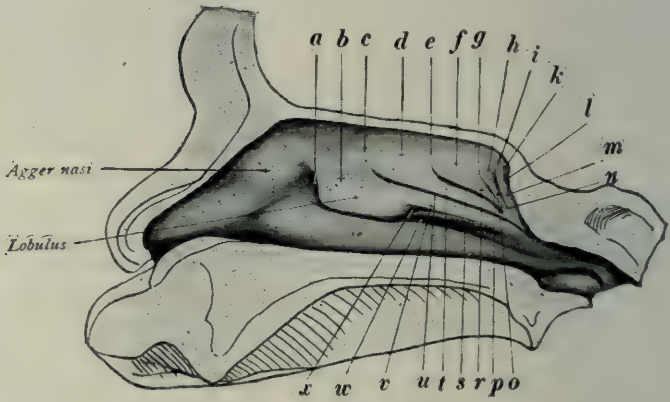
a, c, e, g, i = ascending rami of the ethmoidal meatuses; w, u, s, p, n = descending rami of the ethmoidal meatuses; b, d, f, h, k = ascending crura of the ethmoidal conchae; v, t, r, o, m = descending crura of the ethmoidal conchae; l = sinus sphenoidalis; x = Incisura retrolobularis.

Figs. 24, 25, 26 Drawings of specimens of the lateral wall of the nasal cavity from the anatomic series, Cornell University.

Fig. 24 (× 1.2) From a fetus at term. Shows a marked ascending ramus for the meatus nasi medius. The other ascending rami present are less developed and do not reach the corresponding descending rami. Note also the multiple furrows on the medial surface of the concha nasalis media.

Fig. 25 (× 1.2) From a 7-months fetus. To show the furrows on the concha nasalis media and the lobule in the region of the knee. There is little or no differentiation in the region of the ascending crura for the concha superior and the concha suprema I.

Fig. 26 (× 1.8) From a 190-day fetus. The differentiation into individual ethmoidal conchae has not progressed very far at this early period. Compare with fig. 21.


a
b
c
d
e
f
g
h
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l
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Agger nasi
Lobulus
x
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t
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r
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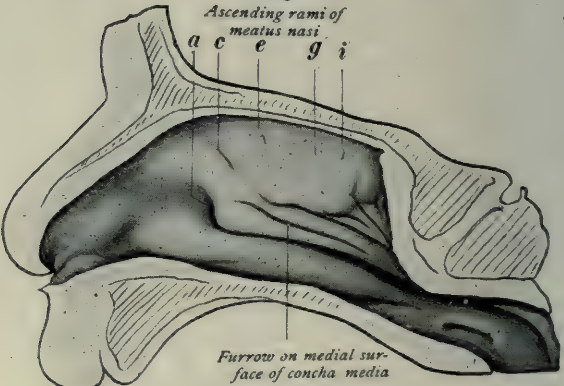
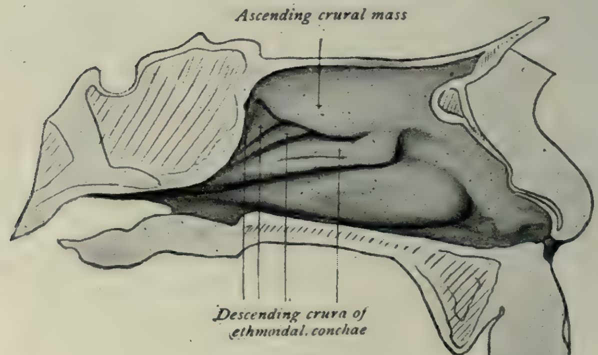
o

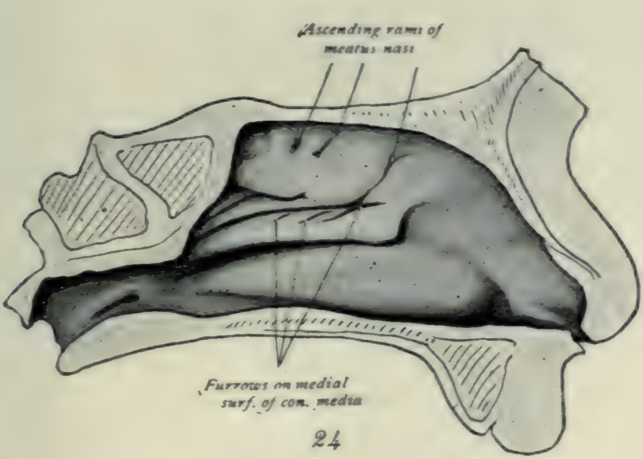
21


Ascending rami of meatus nasi
a
c
e
g
i
Furrow on medial surface of concha media

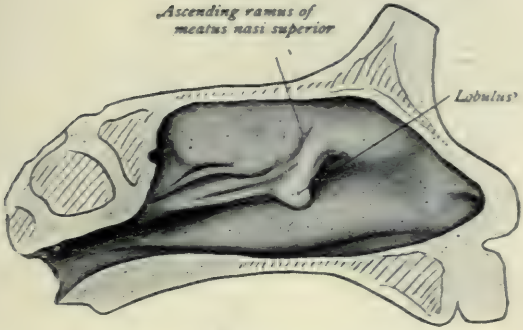
22


Ascending crural mass
Descending crura of ethmoidal conchae

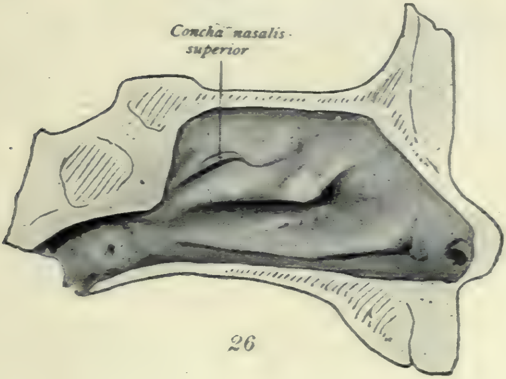
23


Ascending rami of meatus nasi
Furrows on medial surf. of con. media

24


Ascending ramus of meatus nasi superior
Lobulus

25


Concha nasalis superior

26

the ascending ramus of the meatus superior closely approaches the cribriform plate of the ethmoid bone.

Occasionally the whole ascending-crural mass presents an even and unbroken surface; there being no furrows or grooves to throw any portion of the mass into relief. In such instances there is no differentiation of the mass into individual ascending crura; however, we may consider this mass as representing the ascending crura undifferentiated (fig. 23). If not the latter, then we must say that the individual ascending crura coalesced into a general fold or mass at an earlier stage. The former theory is, however, the most plausible, according to my observations. The general ascending-crural mass is often more or less overhanging in character. Again we may have the ascending crura of the concha media and superior

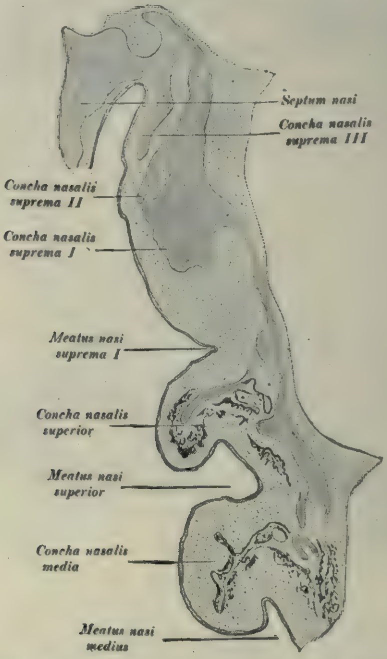
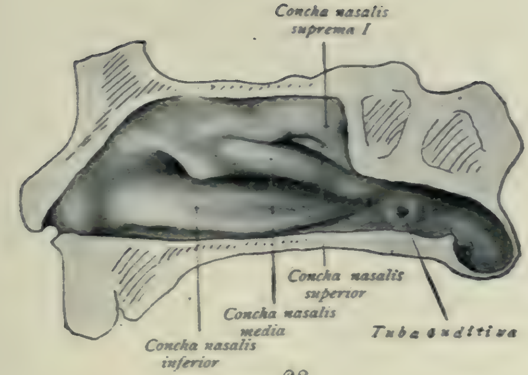
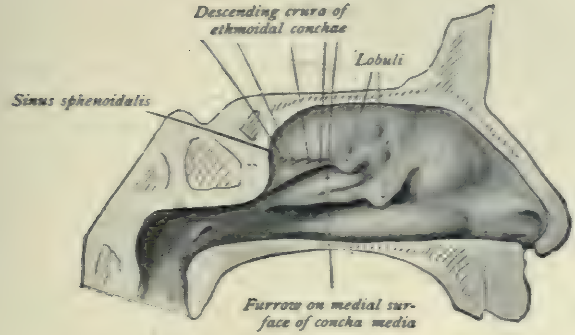


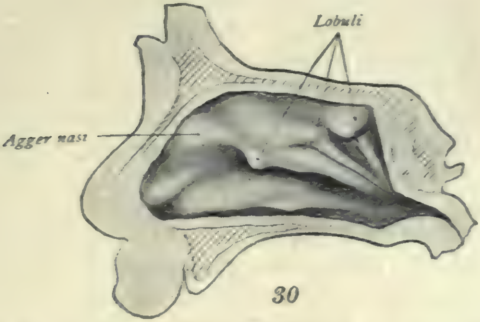
Fig. 27 (× 8) Drawing of a frontal section through the lateral wall of the nasal cavity in the region of the supreme conchae (fetus aged from 7-8 months, series B, slide 48). The concha nasalis inferior is not included in the section.



28


Descending crura of ethmoidal conchae
Lobuli
Sinus sphenoidalis
Furrow on medial surface of concha media

29



30

Figs. 28, 29, 30 Drawings of specimens of the lateral wall of the nasal cavity from the anatomic series, Cornell University.

Fig. 28 (× 1.8) From a 190-day fetus. Note especially the rudimentary character of the concha superior. The accessory concha of the superior meatus cannot be seen.

Fig. 29 (× 1.2) From a 235-day fetus. Note the marked differentiation into descending crura of the ethmoidal conchae. The ascending crural mass is as yet undifferentiated.

Fig. 30 (× 1.2) From a 210-day fetus. Note especially the lobuli on the ethmoidal conchae.

well outlined, while the supreme group (I, II, III) is represented by one fold (fig. 29).

A reference to figs. 21 and 30 will show some of the different combinations met with in the fetal sepcimens examined for the substance of this paper.

The descending crura. The descending crura of the ethmoidal conchæ are, almost without exception, better differentiated than are the corresponding ascending crura. The former also occupy a more nearly horizontal plane; this, however, lessens as we approach the concha suprema III. The middle and superior conchæ present the best marked descending crura. The concha suprema I also frequently possesses a well marked descending crus. The descending crura of the conchæ supremæ II and III are variable and frequently entirely wanting. At times the latter two are fused into one, and then in turn closely associated with the anterior surface of the body of the sphenoid bone, in the region of the developing sinus sphenoidalis. The concha suprema III loses its identity early by becoming associated with the anterior surface of the body of the sphenoid bone.

Lobules and nodules of the ethmoidal conchae. At the junction of the ascending and descending crura, or in the region of the knees, we frequently find overhanging lobule formations. This is a fairly constant condition for the concha media, and it is also very common for the concha superior (figs. 21 and 28). Occasionally the concha suprema I also presents a similar formation, which in some cases more or less overhangs the supreme meatuses and conchæ. In the latter case it really amounts to the ascending crura of the supreme conchæ (fig. 30). Schwalbe in his "Anatomie der Sinnesorgane," refers to the lobule of the concha nasalis media as the "Operculum meatus narium medii." He does not, however, refer to similar formations of some of the other conchæ. Frequently there is a secondary thickening on the middle of the lobules. Zuckerkandl calls attention to this for the lobule of the concha media; however, the other lobules frequently present the same condition (figs. 25 and 30). Killian refers to this secondary prominence as the "Nodulus lobuli." Fig. 30 shows three well formed lobules—the superior one more or less operculating the conchæ and the meatuses in the immediate vicinity. The lobule of the concha media is at times very prominent, and it takes on different shapes, as is evidenced by figs. 21 and 25.

My studies have led me to agree with the statement of Peter, namely, that "Dieser Lobulus mit Nodulus ist der vorderen Spitze der Ethmoturbinalia der Säugetiere zu vergleichen."

Grooves on the concha nasalis media. The concha nasalis media needs further consideration separately, since it presents grooves or furrows on its medial and inferior surfaces (figs. 22, 23, and 25). These furrows which show on the mucous membrane covering the concha, generally present corresponding depressions in the conchal cartilage or bone. At times we find marked furrows on the conchal cartilage, yet the surface remains unfurrowed in these positions. Killian concludes, therefore, that "der Knorpel scheint demnach weit conservativer in der Bewahrung der ursprünglichen Form zu sein, als die Schleimhaut."

The two most constant of these furrows according to my specimens are what may be termed, (1) the superior and (2) the inferior (fig. 25). In fig. 22 we have an extensively developed superior furrow. It more or less splits the descending crus of the concha media into superior and inferior portions. The latter condition led some former investigators (Zuckerkandl and others) erroneously to consider the deep furrow as one of the chief ethmoidal furrows, and the portion of the concha media superior to the furrow, as a separate ethmoidal concha (mittlere Siebbeinmuschel, Zuckerkandl). Seydel later showed the error of this contention, and Zuckerkandl subsequently retracts from his former view in the following words: "Dagegen möchte ich das Gleiche für die untere Siebbeinmuschel nicht mehr aufrecht erhalten, denn wir haben erfahren, dass die mittlere Siebbeinmuschel nicht nur aus einer Teilung der Concha ethmoidalis inferior hervorgeht. . . . . . und stimme O. Seydel bei, der die untere Siebbeinmuschel als Repräsentantin eines einzigen Riechwulstes ansieht."

Killian refers to the furrows of the concha media as "Nebenfurchen," and the notch formed by the inferior furrow differentiating to the free inferior border of the concha media, dorsal to the lobule of the knee, as the "Incisura retrolobularis" (fig. 21). Sometimes the superior furrow is broken into three or more grooves, rather obliquely placed, the ventral one being as a rule the best marked (fig. 24).

ACCESSORY NASAL FOLDS (CONCHAE) AND FURROWS.

Upon turning superiorly the concha nasalis media of the adult nose we expose for study the bulla ethmoidalis and the processus uncinatus—accessory conchæ of the meatus nasi medius. By removing the concha nasalis superior we also expose in very many cases an accessory fold or concha on the lateral wall of the meatus nasi superior which is comparable to the bulla ethmoidalis. These structures contained in the middle and the superior meatuses are hidden or accessory nasal conchæ, comparable to the accessory conchæ found in mammals. In the middle meatus we also note the hiatus semilunaris, and if the processus uncinatus be turned inferiorly the infundibulum ethmoidale is exposed. In the superior and ventral portion of the middle meatus we note varying relations in different specimens between the nasofrontal duct and the infundibulum ethmoidale and some of the anterior ethmoidal cells. The ostia of ethmoid cells are also to be seen in the meatus medius, superior, and suprema I—the relations of these ostia varying much in different specimens.

In order to interpret these varying adult conditions and relations, it is essential that we study the developmental changes in the middle and the superior meatuses at some length in the embryo, late fetus, and in the young child. This will at once point out the probabilities of development and the varying adult conditions one may expect to meet in a series of specimens.

The accessory folds and furrows of the descending ramus of the meatus nasi medius. If we examine serial frontal sections of the nose of a 40-day embryo we will find that the lateral wall of the meatus nasi medius is more or less even and simple. If, on the other hand, we examine the same region in embryos aged from 50 to 60 days we will find a somewhat crescentic shaped fold with its free border directed superiorly, breaking the evenness of the wall. The latter is the anlage of the processus uncinatus and the first of the series of accessory folds to appear on the lateral wall of the meatus medius. This fold at once aids in forming a furrow immediately superior to it—the primitive infundibulum ethmoidale. It is quite probable that the furrow first establishes an anlage and this in turn throws into slight relief a portion of the mucous membrane inferior to it, thus establishing the anlage of the processus uncinatus. It may, however, be said that both structures are more or less dependent upon each other in establishing anlages. The same principles are obviously here involved just as they are in forming the primitive nasal meatuses and conchæ.

From this furrow (primitive infundibulum ethmoidale) the sinus maxillaris develops its anlage in the form of an evagination of the mucous membrane. This maxillary sinus anlage begins to be established from the sixty-fifth to the seventieth day of embryonal life. In a former paper I suggested that primitively the pouching of the sinus maxillaris aided in deepening the infundibulum ethmoidale; thus causing the processus uncinatus to stand out better at an early period.

Shortly after this we have the first evidence of the bulla ethmoidalis, appearing superior and lateral to the processus uncinatus. The bulla ethmoidalis is first indicated by special thickenings (one or two) of the lateral plate of cartilage—the cartilaginous thickenings appearing on its medial surface. At first the bullar anlages do not cause the mucous membrane to bulge towards the lumen of the nasal cavity; hence these early stages pass unobserved unless one examine serial frontal sections through this region. Later, however, say in a 120-day embryo, the cartilaginous prominences have developed sufficiently to push the mucous membrane on the lateral wall of the meatus medius into relief (figs. 17 and 18). We now have established a fold, or folds (bullar folds), lateral and superior to the processus uncinatus. If two folds appear there is an intervening furrow. These folds represent the primitive bulla ethmoidalis. Usually the intervening furrow, when present, disappears after birth. Occasionally, however, an ethmoidal cell develops from this furrow.

Thus far no mention has been made of another fold that appears in many cases inferior to the bullar folds and lateral to the infundibulum ethmoidale. Because of its relations to the infundibulum ethmoidale I shall speak of this as the infundibular fold. It is never very prominent and forms in part the lateral wall of the infundibulum ethmoidale. It may persist as a fold after birth, but it generally becomes leveled down to an even surface which imperceptibly passes on to the bullar surface.

It will, therefore, be seen that we have, during the latter half of intrauterine life, fairly well outlined grooves and folds on the lateral wall of the descending ramus of the meatus medius. If we take into consideration the extreme cases found in the late fetus we have thus formed four folds and four furrows. These folds may appropriately be named superior and inferior bullar folds, infundibular fold, and processus uncinatus; the furrows, the suprabullar furrow or recess, the bullar furrow, the infrabullar furrow, and the infundibulum ethmoidale. The suprabullar recess and the infundibulum ethmoidale are constant and are the most important furrows. The others are of less importance and are more irregular and inconstant in their development (figs. 31 and 34).

Killian, who has studied this region extensively, finds a similar number of folds and furrows on the lateral wall of the middle meatus. He, however, considers the processus uncinatus as the descending crus of his "erste Hauptmuschel," hence includes it in the class of regular ethmoidal conchæ. My superior bullar, inferior bullar, and infundibular folds or conchæ correspond to his "obere, mitt'ere, und untere Nebenmuscheln," respectively. My suprabullar, bullar, and infrabullar furrows, and infundibulum ethmoidale correspond to his "Recessus superior, obere Zwischenfurche, untere Zwischenfurche, und Recessus inferior," respectively.

The suprabullar furrow or recess. The suprabullar furrow or recess is practically constant. It varies somewhat in its form and extent, but all specimens give some evidence of it. At times it continues ventrally and superiorly almost to the cribriform plate of the ethmoid bone (fig. 38); however, in the majority of cases it does not extend so far, due to partial fusion between the superior border of the superior bullar fold and the attached border of the concha media (fig. 41). It is frequently also limited inferiorly and dorsally by similar fusion. Again, there may be multiple points of fusion between the superior bullar fold and the concha media, thus breaking the suprabullar recess or furrow into several compartments (fig. 43). The recess in many cases early tends to deepen or pouch laterally and inferiorly behind the bullar folds (fig. 35). In this manner the bulla becomes more or less shell-like in structure; and some of the so-called bullar cells are thus established. The suprabullar recess is a constant point from which anterior ethmoidal cells develop (figs. 31, 34, and 43).

The bullar furrow. The bullar furrow is placed between the two bullar folds or accessory conchæ (fig. 31). It is variable in its differentiation and not at all constant. It is generally obliterated by the superior and the inferior bullar folds becoming continuous structures in the formation of the adult bulla ethmoidalis. This coalescence is, however, not always absolute, in that an ethmoidal cell may develop from the furrow, leaving the ostium of the adult cell at the point of the primitive furrow (figs. 31 and 39). Even in many adult specimens we find evidences of this primitive furrow in the form of a shallow groove on the medial surface of the bulla ethmoidalis. An ethmoidal-cell ostium on the medial surface of the bulla ethmoidalis is almost invariably the remains of the early bullar furrow.

The infrabullar furrow. The infrabullar furrow is placed between the inferior bullar and the infundibular folds (fig. 31). It is very inconstant and when present is frequently obliterated by the inferior surface of the bulla ethmoidalis becoming continuous with the infundibular fold. In some cases it is fairly well marked (fig. 34), but, as a rule, it is of minor importance. Rarely an ethmoid cell develops from the furrow—the adult cell draining into the infundibulum ethmoidale.

The infundibulum ethmoidale. The infundibulum ethmoidale (Recessus inferior der absteigenden Schenkel der ersten Hauptfurche of Killian) is invariably present in some form. It is formed early, and obviously aids in establishing the primitive processus uncinatus. It is directed somewhat ventrosuperiorly and at its ventral and superior termination it may end blindly or develop into an anterior ethmoid cell. At other times it is variously continued into one of the frontal furrows. Rarely it continues its development ventrally and superiorly, remaining lateral to the frontal furrows, and in this way may establish the frontal sinus (figs. 36, 37, 39, and 40).

Dorsally and inferiorly it either gradually loses its depth and thus becomes continuous with the middle meatus, or it ends rather abruptly in a pocket, due to the superior and lateral curving of the dorsal end of the processus uncinatus at this point (fig. 49). From the infundibulum ethmoidale the sinus maxillaris develops, hence in the adult the latter sinus communicates with the infundibulum ethmoidale, and only indirectly via the hiatus semilunaris with the meatus nasi medius fig. 18).

The superior bullar fold or concha. The superior bullar fold or concha is located immediately inferior to the suprabullar recess (fig. 31). It may continue independently ventrally and superiorly almost to the cribriform plate of the ethmoid bone.

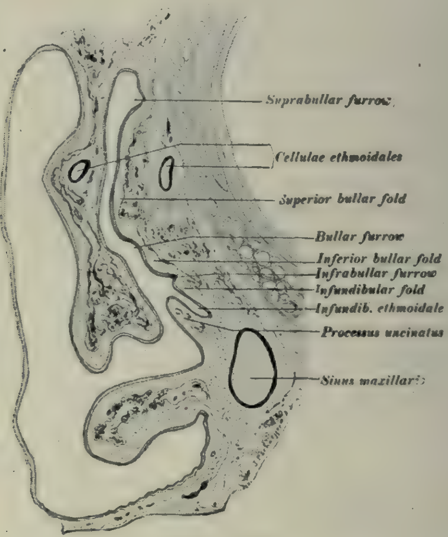
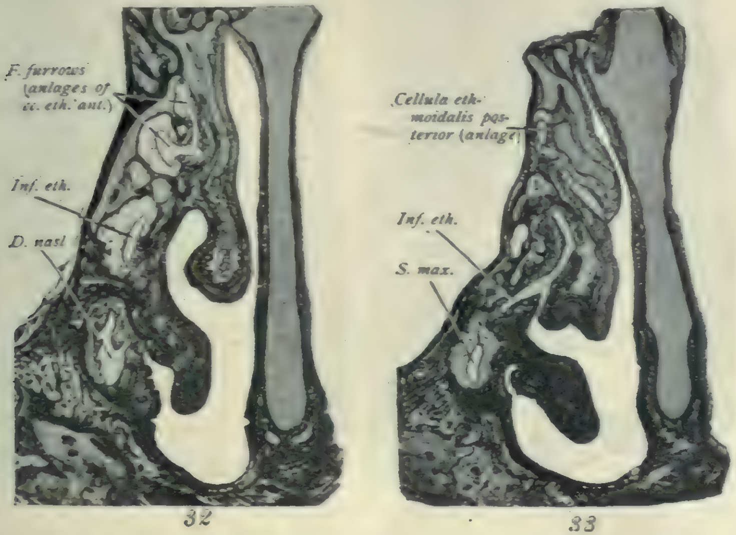


Fig. 31 (× 3.9) Drawing of a frontal section of the left nasal fossa of a term fetus (series D, slide 5).

Note the individual folds comprising the bulla ethmoidalis, and the fold lateral to the infundibulum ethmoidale, and the furrows that border these folds. The cell that is indicated in the superior bullar fold is an extension from the suprabullar furrow, and the cell indicated in the concha media communicates a few sections farther dorsally with the meatus nasi medius (compare with fig. 35).

In other cases it may be fused at certain points with the attached border of the concha nasalis media (figs. 41 and 43). It is frequently continuous with one or more frontal folds (fig. 41). It usually comes to form the chief bulk of the adult bulla ethmoidalis. In many cases there is no differentiation into superior and inferior bullar folds by an intervening furrow—the bullar furrow.

The inferior bullar fold or concha. The inferior bullar fold or concha is, as stated above, not always differentiated from the superior bullar fold. It is, however, occasionally well isolated and stands more or less as an independent fold (figs. 34 and 39). The latter condition is especially marked in the cases where an anterior ethmoid cell develops from the bullar furrow (fig. 39). I agree with Killian that the superior and inferior bullar folds (obere und mittlere Nebenmuscheln, Killian) usually coalesce to form the adult bulla ethmoidalis. Sometimes, even in the adult, we see evidences of the primitive bullar furrow, which more or less grooves the medial surface of the adult bulla. In many instances coalescence is, however, not necessary because there was at no time a differentiation into two portions.

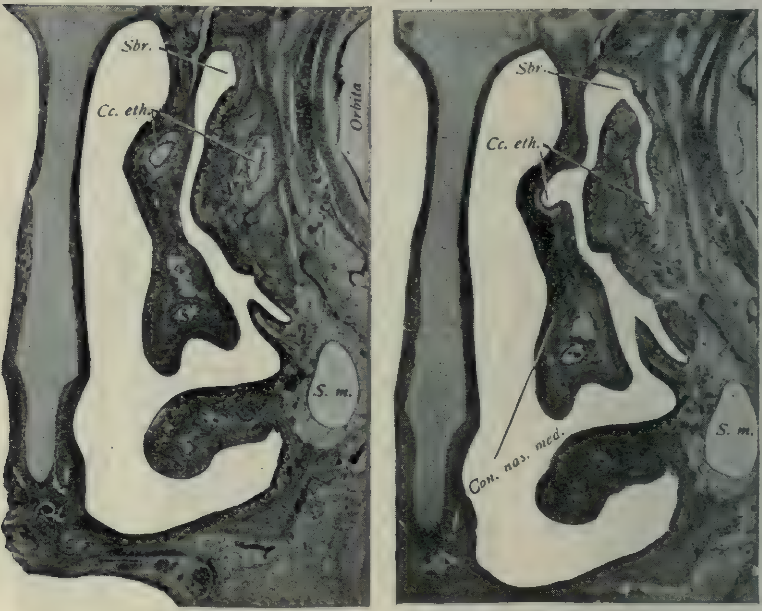

F. furrows (anlages of cc. eth. ant.)
Inf. eth.
D. nasl
Cellula ethmoidalis posterior (anlage)
Inf. eth.
S. max.
32
33

Figs. 32 and 33 Photomicrographs of frontal sections through the right nasal fossa of a 7-months fetus (series B, slide 31). Section fig. 32 is through the ventral portion, and section fig. 33 is through the dorsal portion of the fossa.

The frontal furrows have pouched towards the frontal region in the establishment of early anterior ethmoid cells (fig. 32).

See page 324 for explanation of lettering.

The infundibular fold or concha. The infundibular fold is very rudimentary and more or less inconstant. It is located lateral to the infundibulum ethmoidale and in part forms its lateral wall (fig. 35). It is more or less separated from the inferior bullar fold by the shallow infrabullar furrow. It usually loses its identity in the adult, in that it imperceptibly passes to the bullar surface by the obliteration of the infrabullar furrow. Occasionally it is well marked and is more or less isolated from the inferior bullar fold by a relatively deep infrabullar furrow. Rarely it retains its identity in the adult



34

35

Fig. 34 and 35 Photomicrographs of frontal sections through the left nasal fossa in the region of the bullar folds from a term fetus (series D, slides 5 and 6). Note the bullar folds, the cells in the concha media, and the superior bullar fold in fig. 34. In fig. 35, which is a section farther dorsal, the ostia of the cells are shown. It shows how the suprabullar furrow or recess tends to develop or pouch behind and lateral to the bullar folds; this in time causes the bulla to become shell-like.

F. furrows, = frontal furrows; Cc. eth. ant., = cellulae ethmoidales anterior; Inf. eth., = infundibulum ethmoidale; D. nasal., = ductus nasolacrimalis; S. max., = sinus maxillaris; Sbr., = suprabullar recess or furrow; Cc. eth., = cellulae ethmoidales; S. m., = sinus maxillaris; Con. nas. med., = concha nasalis media.

—this is especially so when an anterior ethmoidal cell develops from the infrabullar furrow.

The processus uncinatus. The processus uncinatus is a constant structure, and is medial and inferior to the infundibulum ethmoidale. As was stated before, it is the first of the accessory or hidden conchæ to be differentiated. At its ventral and superior end it terminates in various ways. In some cases it is continuous with one or more frontal folds and at the same time its base continued on to the agger nasi (fig. 41). In other instances it is fused with the lateral surface of the concha media at its ventral extremity, or even fused with the ventral extremity of the bullar folds. Ventrally and inferiorly the

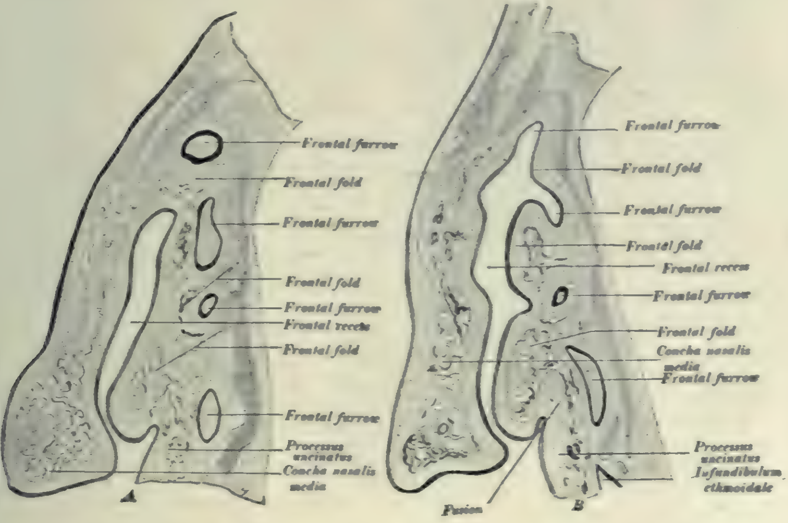


Fig 36 (× 8) Drawings of frontal sections through a portion of the lateral nasal wall of a 7-months fetus, in the region of the frontal recess (series C, slide 5). Section A is farther ventral than is section B.

Note the blind ventral extremities of the frontal furrows in section A which, at this plane of section, are in reality early anterior ethmoidal cells. Any one of these cells may develop into a frontal sinus, or two may develop sufficiently far to be called frontal sinuses. The frontal recess may also develop into the frontal sinus.

In section B some of the furrows communicate freely with the frontal recess, and at this plane of section are more truly frontal furrows.

base of the processus uncinatus becomes continuous with the surface of the agger nasi. Some observers class the processus uncinatus with the general ethmoidal conchæ.

The accessory folds and furrows of the ascending ramus of the meatus nasi medius, i. e., of the recessus frontalis. In a previous paragraph mention was made of the rather early beginning of an extension of the meatus nasi medius from its ventral and superior part. This extension of the middle meatus towards the frontal region is the first step in the formation of the frontal sinus and certain of the anterior ethmoid

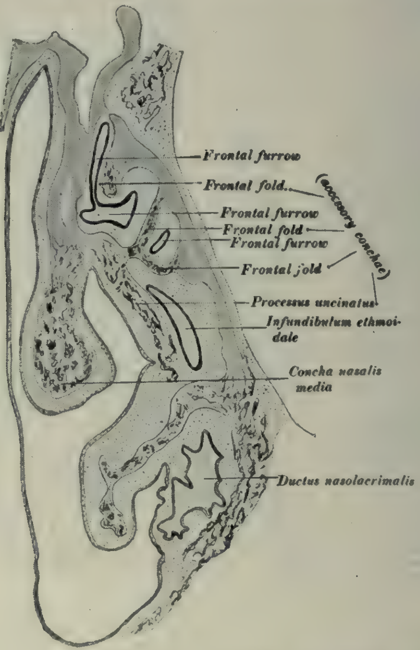


Fig. 37 (× 5) Drawing of a frontal section through the left nasal fossa of a fetus aged approximately 7 months (series B, slide 31). The section is in the region of the frontal recess.

Note the frontal folds (accessory conchae) and the frontal furrows. Some of the furrows, either by coalescence of the folds or by the extension of the furrows towards the frontal region, end blindly and represent early anterior ethmoid cells. The frontal recess is really obliterated by the coalescence of some of the frontal folds with the lateral surface of the concha nasalis media—compare this condition with that found in fig. 36 B.

cells. To this extension or recess Killian has given the appropriate name, "Recessus frontalis." For some time the lateral wall of this recess (ascending ramus of the middle meatus) is even and unbroken. If we examine frontal and horizontal sections of the recess of a 4-months fetus we will find the lateral plate of cartilage thickened at certain points, in the form of projections directed towards the lumen of the nasal fossa. For some time this condition prevails and the mucous membrane is not at first thrown into relief. These thickenings, which I find vary in number, are in anticipation of the folds (accessory conchæ) which are present on the lateral wall of the frontal recess of a later fetus.

The folds as found in the late fetus are variable in number and as a rule are not very prominent. Their prominence depends largely upon the degree of development of the intervening furrows or pits. The folds as a rule more or less lose their identity after birth, and the furrows or pits variously remain as ostia of anterior ethmoid cells. The folds have been appropriately termed frontal folds or conchæ, and the bordering furrows or pits, frontal furrows.

The frontal folds and furrows vary in degree of development and differentiation. We frequently find specimens with four well formed furrows and three resulting folds (fig. 41). In other cases, either by earlier coalescence or, I think better, by a lessened degree of differentiation, we have a smaller number of folds and furrows (fig. 40). In fig. 41 it will be noticed that the processus uncinatus is continuous with the first and second frontal folds. The processus uncinatus in the latter case also sends a fork towards the agger nasi, and gains slight fusion with the lateral surface of the concha nasalis media. The superior bullar fold is in part directly continuous with what might be termed the third frontal fold. In fig. 38 we find that the processus uncinatus is continued ventrally and superiorly to the agger nasi; in part fusing with the concha nasalis media at this point. The superior and inferior bullar folds in the latter instance are continued superiorly to become continuous with the first and second frontal folds. Note that the third frontal furrow is more or less continuous with the suprabullar recess, and that the latter recess continues almost to the cribriform plate of the ethmoid bone. The infundibulum ethmoidale continues ventrally and superiorly into a frontal furrow. Compare this condition of the infundibulum ethmoidale with that found in figs. 39 and 41.

In fig. 40 there is only one frontal fold or concha differentiated. The concha is bordered by two frontal furrows, and the infundibulum ethmoidale is continued ventrally and superiorly into these furrows. In fig. 39 the processus uncinatus is continued ventrally on the lateral wall of the frontal recess and apparently the frontal folds extend from it. In the latter figure note also the relations of the infundibulum ethmoidale in the region of the frontal recess, and the superior and inferior bullar folds and the infundibular fold.

At times the frontal folds or conchæ fuse with the lateral surface of the concha nasalis media, and in this manner we have the obliteration of the frontal recess. In such cases the sinus frontalis must develop from an anterior ethmoid cell, and not by direct extension of the frontal recess (fig. 44). In fig. 36 the frontal folds have not fused with the lateral surface of the concha nasalis media and, therefore, the frontal recess is maintained. In such a condition the sinus frontalis may develop either from the frontal recess or from one or more anterior ethmoid cells. It is difficult to say in the latter figure whether the frontal folds or conchæ have coalesced with one another, thus constricting off small blind pouches (early anterior ethmoid cells), or whether the frontal furrows in anticipation of anterior ethmoid cells have pouched toward the frontal region, thus closely simulating coalescence between the several frontal folds, but making coalescence only apparent rather than real.

A comparison of figs. 36 to 42 (showing both frontal sections and surface views of the frontal recess and the descending ramus of the meatus medius) will materially aid in clearing up the various adult conditions one meets in these regions, in connection with the gross anatomy and relations of the nasofrontal duct, the infundibulum ethmoidale, and the bulla ethmoidalis.

The accessory fold or concha of the meatus nasi superior. At this juncture mention must again be made of a rather frequent accessory concha that is differentiated rather early on the lateral wall of the descending ramus of the meatus nasi superior (fig. 45). Seydel directs attention to it in the following words: "Bei menschlichen Embryonen fand ich einige

Male in dem Spalt zwischen der mittleren und obern Muschel, also an der Stelle, wo bei den Halbaffen die zweite Nebenmuschel liegt, eine niedrige leistenförmige Erhebung der seitlichen Nasenwand . . . Ich möchte diese Bildung als Rest der Nebenmuschel deuten."

The anlage of this accessory concha is indicated rather early, and by the fourth month of fetal life it is well established (fig. 19). Killian considers this fold important as a point for orientation: "Die Nebenmuschel im Bereiche der zweiten Hauptfurche ist, wenn nachweisbar, ein vorzügliches Orientirungsmittel namentlich zur Bestimmung des Crus descendens 3," i. e., the crus descendens of my concha nasalis superior. Some earlier writers thought that the concha superior developed or became differentiated from the concha media—this because of the furrow that is very frequently found on the medial surface of the descending crus of the concha media in the fetus (fig. 22). Seydel later pointed out the error of this contention, and Zuckerkandl agreed that he previously was in error in saying that the "mittlere Siebbeinmuschel" (concha superior) was differentiated from the "untere Siebbeinmuschel" (concha media). Zuckerkandl then advances the theory "dass die mittlere Siebbeinmuschel nicht nur aus einer Teilung der Concha ethmoidalis inferior hervorgeht, sondern über derselben und unabhängig von ihr sich entwickelt und als Rudiment in der unteren Siebbeinspalte steckend angetroffen wird." It appears that Zuckerkandl in speaking of the variations of the "mittlere Siebbeinmuschel," at times mistakes the accessory concha of the superiod meatus for his "mittlere Siebbeinmuschel" (concha nasalis superior). What he designates as the "Anlage der mittleren Siebbeinmuschel" (Tafel VII, Fig. XI, Normale und pathologische Anatomie der Nasenhöhle und ihrer pneumatischen Anhänge, Bd. I, Wien und Leipzig, 1893), certainly corresponds to my accessory concha of the superior meatus, and not to my concha nasalis superior.

In case the accessory concha of the superior meatus is well developed we have fairly well formed superior and inferior recesses. The inferior recess is especially deep in the cases where the "crista suprema" of Killian is well developed (fig. 45). This condition makes the superior meatus look much like the middle meatus, i. e., the accessory concha of the superior meatus takes the place of the bulla ethmoidalis (accessory concha of the middle meatus), and the "crista suprema" takes the place of the processus uncinatus (compare figs. 18 and 45).

The inferior recess of the superior meatus may continue superiorly and ventrally into the blind superior termination of the superior meatus. The accessory concha is, however, at times wholly or in part coalesced with the concha media, thus obliterating wholly or partly the inferior recess. Frequently a posterior ethmoidal cell develops from the inferior recess. The superior recess is often obliterated by coalescence between the accessory concha and the concha superior. In other instances the superior recess may be continued ventrally and superiorly to the blind end of the meatus superior. Occasionally an ethmoid cell develops from this recess.

IV. The Anlages of the Sinus Paranasales.

After the preceding consideration of the meatus nasi and the conchæ nasales, and the accessory folds and furrows, the genesis of the sinus paranasales becomes much simplified and fairly easy of interpretation. That all of the paranasal chambers develop from preformed or pre-existing furrows is certainly in accord with my observations. Since the paranasal or accessory cavities develop from preformed furrows and recesses, it is difficult to say just when they begin to establish anlages. I, however, believe that anlages are established much earlier than is generally supposed—in fact, the furrows and recesses from which the paranasal sinuses develop are in a sense the "primitive" anlages of these chambers. The early tendency for the sinuses to establish their "first" anlages may be no mean factor in making the recesses and furrows what they early are.

The pre-existing spaces from which paranasal air chambers may develop, according to my studies, are: (1) the suprabullar recess, (2) the bullar furrow, (3) the infrabullar furrow, (4) the infundibulum ethmoidale, of the descending ramus of the meatus nasi medius; (5) the frontal furrows, (6) the frontal recess, of the ascending ramus of the meatus nasi medius; (7) the ventral and superior extremity of the meatus nasi superior, (8) the recessus superior, (9) the recessus in-

EXPLANATION OF FIGURES.

Figs. 38, 39, 40 Drawings from dissections of specimens from the anatomic series, Cornell University. The dissections have been made with special reference to the furrows and folds on the lateral surface of the frontal recess, and the bullar folds on the lateral wall of the descending ramus of the meatus medius. The specimens are from term fetuses.

Fig. 38 (× 1.8) The concha media has been partly cut away so as to expose the frontal recess and its structures and the bullar folds and furrows. The processus uncinatus has also been partly cut away so as to get a better exposure of the bullar folds and the primitive sinus maxillaris.

Fig. 39 (× 1.2) The concha media has been partly cut away, thus securing a good exposure of the frontal recess with its folds and furrows, and the folds and furrows of the bulla ethmoidalis. The infundibular fold is also well shown in the drawing.

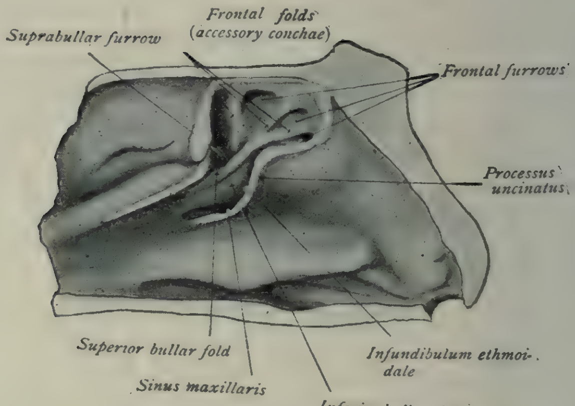
Fig. 40 (× 1.2) Especially note the frontal recess and the low degree of differentiation of frontal folds as compared with the specimens represented in figs. 38 and 39. The processus uncinatus is too large to allow the inferior bullar fold to be seen. Portions of the concha media and superior have been cut away.

Figs. 41, 42, 43 Drawings from dissections of specimens from the anatomic series, Cornell University. The dissections have been made with especial reference to the ascending and descending rami of the meatus medius. The concha media is partly cut away in all the specimens.

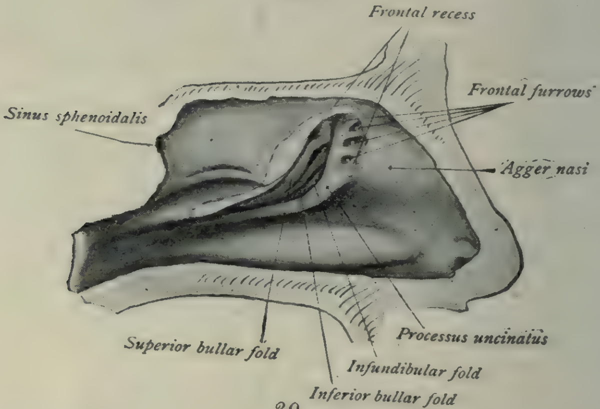
Fig. 41 (× 1.2) Shows the well formed frontal folds (conchae) and furrows on the lateral wall of the frontal recess, also the accessory concha of the meatus superior. From a term fetus.

Fig. 42 (× 1.2) Note the manner of pouching of the frontal furrows and the frontal recess in the formation of anterior ethmoidal cells and the frontal sinus; also the developing sinus sphenoidalis. This specimen was from a child aged approximately five months.

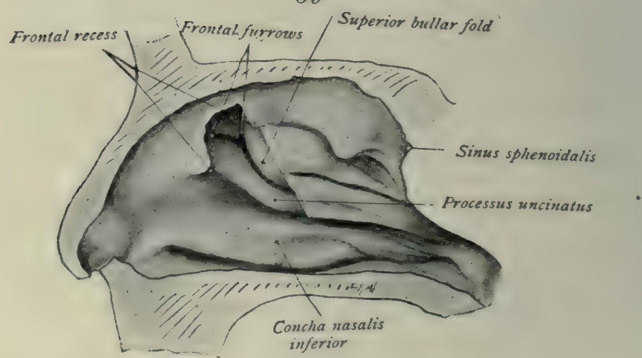
Fig. 43 (× .6) In this specimen there were apparently no frontal folds nor furrows, or they were early obliterated. It will be noticed that the frontal recess is expanding towards the frontal region in the establishment of the frontal sinus. Note also the multiple ethmoid cell anlages in the region of the suprabullar furrow. From a child aged approximately fourteen months.


Frontal folds
(accessory conchae)
Suprabullar furrow
Frontal furrows
Processus uncinatus
Superior bullar fold
Infundibulum ethmoidale
Sinus maxillaris
Inferior bullar fold

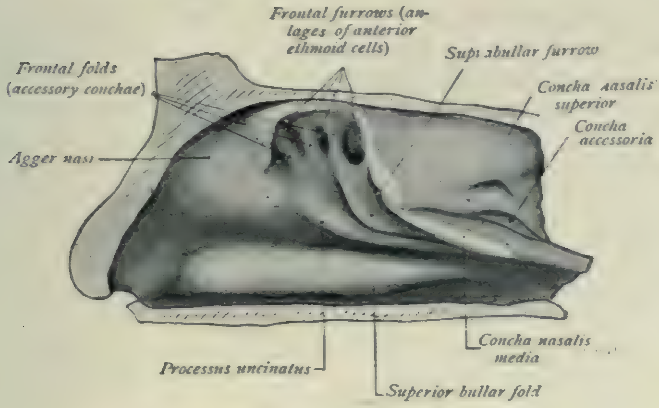
38


Frontal recess
Frontal furrows
Sinus sphenoidalis
Agger nasi
Processus uncinatus
Superior bullar fold
Infundibular fold
Inferior bullar fold

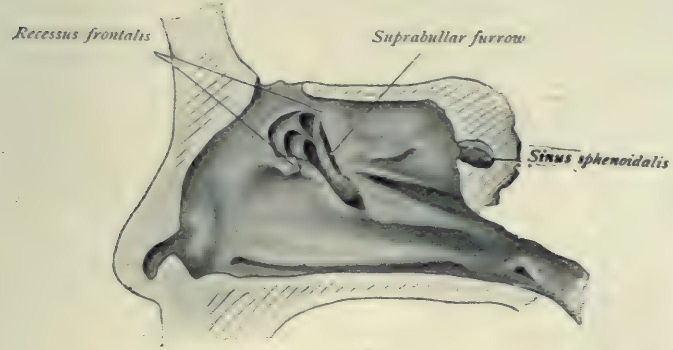
39


Frontal recess
Frontal furrows
Superior bullar fold
Sinus sphenoidalis
Processus uncinatus
Concha nasalis
inferior

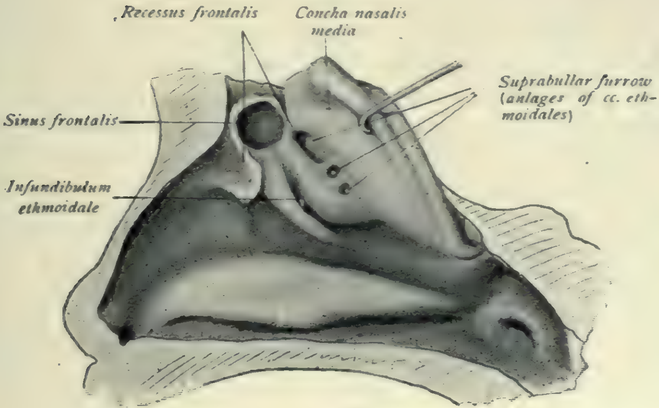
40


Frontal furrows (anlages of anterior ethmoid cells)
Suprabullar furrow
Frontal folds (accessory conchae)
Concha nasalis superior
Concha accessoria
Agger nasi
Concha nasalis media
Processus uncinatus
Superior bullar fold

41


Recessus frontalis
Suprabullar furrow
Sinus sphenoidalis

42


Recessus frontalis
Concha nasalis media
Suprabullar furrow (anlages of cc. ethmoidales)
Sinus frontalis
Infundibulum ethmoidale

43

ferior, of the meatus nasi superior; (10) the meatus nasi suprema I.

Of the above named spaces we rarely find air cells developing from the infrabullar furrow, and only occasionally from the bullar furrow. I, however, find that rather frequently posterior ethmoid cells develop from the inferior and superior recesses of the meatus nasi superior, and about 75 per cent of specimens in which the meatus suprema I persists we find a posterior ethmoidal cell developing from the latter meatus (the meatus nasi suprema I is present in about 62.5 per cent of adult specimens). I find that the remainder of the aforementioned spaces are quite constant in cell development. We must, however, remember that the development of cells from the frontal furrows and recess is very variable.

Because the anlages of the paranasal chambers have primitively different relations, Killian divides them thus:

"1. solche, die zwischen je zwei Hauptmuscheln (I. Ordnung);

2. solche, die zwischen einer Haupt- und einer Nebenmuschel (II. Ordnung) und

3. solche, die zwischen je zwei Nebenmuscheln gelegen sind (III. Ordnung)."

Varying views have been advanced by different writers as to the genesis of the parnasal chambers. Dursy thought that the establishment of all the accessory air spaces of the nose, with the exception of the anlages of the maxillary and sphenoidal sinuses, was wholly dependent upon resorptive processes taking place in the cartilaginous and bony framework of the nose. This is certainly not the earliest factor involved in the establishment of anlages. Others, who worked this region in some of the lower forms, considered the space included by the lateral curling of some of the conchæ as ethmoidal cells—a view that is not tenable. Seydel in a subsequent paper, comes nearer the truth when he writes: " . . . ihre Entwicklung von den Spalten zwischen je zwei (auch rudimentären) Muscheln ausgeht."

Killian in '96, in an exhaustive paper, places to my mind the genesis of the paranasal chambers on a sound basis. My observations in the main agree with his. Whether, as Killian's schemata suggest, coalescence takes place between neighboring folds and conchæ, thus constricting off a portion of the respective furrow to become the anlage of a cell, seems to me a difficult problem to solve. I rather hold that the nasal mucous membrane in the position of the furrow pouches in the direction of a future cell—this closely simulating coalescence of neighboring accessory folds, or an accessory fold and a concha at these points. There seems to be an inherent tendency for the nasal cavity early to enlarge its surface area by the formation of furrows, folds, and pouches. It indeed seems difficult to decide whether, for example, in figs. 36 and 44, the frontal folds or conchæ coalesced with each other, thus forming blindly ending furrows, or whether the frontal furrows pouched in the frontal direction, thus simulating coalescence but making it only apparent rather than real. It, however, matters very little what interpretation we place here —probably both factors are more or less involved—the fact remains that from these pre-existing furrows and recesses the accessory air spaces develop. This is true of all the paranasal chambers with the single exception of the sphenodial sinus, which is at first, as former writers have pointed out, nothing but a constriction from the dorsal and superior portion of the nasal fossa. Of course the factors of growth (of the sac) and resorption (of surrounding tissue) are early brought into play (fig. 20).

THE SINUS MAXILLARIS.

The sinus maxillaris is primitively merely a pouching or evagination of the mucous membrane of the infundibulum ethmoidale. This pouching is very evident about the seventieth day of fetal life, and is best shown by reconstructing the infundibulum ethmoidale. The earliest changes in its anlage-formation are so slight that they are difficult of appreciation by an examination of serial sections only. The anlage of the sinus maxillaris is usually represented by a single pouch, but, as I stated in a previous paper, we sometimes find two pouches growing side by side from the infundibulum ethmoidale. Again the pouching may be very extensive, and in these cases it is indeed hard to say where the infundibulum ethmoidale ends and where the anlage of the sinus maxillaris begins. In such cases the infundibulum ethmoidale is in a sense a part of the sinus maxillaris. Seydel makes the general statement that "der Raum des Infundibulum, der zwischen Processus uncinatus und Orbitalwand liegt, ist als ein Theil des Sinus (sinus maxillaris) zu beurtheilen." If we accept the above interpretation then the sinus-maxillaris *anlage* is established with the first evidences of the infundibulum ethmoidale. Zuckerkandl also, presumably, considers the infundibulum ethmoidale a part of the early sinus maxillaris. What he labels "S. m." (Sinus maxillaris), (Tafel XI, Figs. 5, 6, Normale und pathologische Anatomie der Nasenhöhle und ihrer pneumatischen Anhänge, Bd. I, Wien und Leipzig, 1893) is certainly in part infundibulum ethmoidale. We seldom see the primitive sinus maxillaris so far ventral as Zuckerkandl represents it to be in Fig. 6, Taf. XI, of the above named work. What he labels "S. m." in the latter figure is, I think, wholly infundibulum ethmoidale, *i. e.*, a frontal section of the superior and ventral portion of it. I, however, think that we should speak of the sinus maxillaris as developing from the pre-existing furrow (infundibulum ethmoidale), and not consider the latter a part of the sinus maxillaris. However, as stated before, it is difficult at times to draw this distinction; especially so when the primitive sinus maxillaris is extensive and occupies the greater portion of the infundibulum ethmoidale in its early pouching.

The duplication of the primitive maxillary pouch, and the extensive pouching that we occasionally have, is entirely in accord with adult conditions—in that the adult ostium maxillare varies from a small aperture to a long slit-like opening, while in other cases the ostium is duplicated. In this connection I may be permitted to quote briefly from an earlier paper: "I have found the primitive maxillary pouch duplicated. . . . This may explain some of the duplications of the ostium maxillare of the adult sinus. The two primary pouches may fuse distally, leaving the two points of evagination as the ostia maxillaria of the adult cavity. This embryonal condition in all probability explains some of the cases in which the sinus maxillaris is divided into two partly or wholly separate compartments by a vertical partition, *i. e.*, each pouch developing into an adult cavity independent of its mate . . . The great differences in the dimensions of the adult ostium may be due to the coalescence of two or more maxillary pouches; or the primitive pouching may have been single but extensive."

The early sinus maxillaris is for a time a slit-like cavity in the lateral wall of the nose. It extends inferiorly into the recess formed by the union of the cartilage of the lateral wall with that of the concha nasalis inferior (fig. 18). By resorption (of cartilage) and growth (of sac), the sinus ultimately breaks through the cartilage in the position mentioned above (figs. 31 and 34). Its further extension into the body of the maxilla is accomplished by the simultaneous growth of the sinus and the resorption of surrounding bone, this taking place *pari passu* with the growth of the face.

For a further consideration of the sinus maxillaris the reader is referred to a previous paper by the writer bearing directly upon this cavity.

THE SINUS FRONTALIS.

The point from which the sinus frontalis develops is somewhat variable. Like the sinus maxillaris it develops from a preformed cavity or space. In a previous paragraph mention was made of the frontal recess, and of the folds and furrows which configure its lateral wall. The recess and the furrows especially concern us in connection with the development of the sinus frontalis. It will be recalled that the number of furrows is variable, and that the infundibulum ethmoidale bears inconstant relations to these furrows (figs. 38 to 43). At term, or even somewhat earlier, the furrows have already pouched at their superior ends towards the frontal region, thus forming early anterior ethmoidal cells. Frontal and horizontal sections will, therefore, if made at appropriate planes, show cross-sections of cavities instead of furrows (compare figs. 32, 36, and 44). The frontal recess is at this time also quite roomy and is more or less variable in its extent (figs. 36 and 41).

As Killian has properly pointed out, the frontal sinus may develop from one or more anterior ethmoid cells, from an ethmoid cell and the frontal recess, or by direct extension of the whole frontal recess. At birth it can hardly be said from what point the frontal sinus will ultimately develop into the adult cavity. According to my studies the frontal sinus may also in exceptional cases develop from the superior and ventral end of the infundibulum ethmoidale, *i. e.*, the infundibulum ethmoidale continuing its development superiorly and ventrally, lateral to the frontal recess and frontal furrows.

and then expanding into the sinus frontalis. In the vast majority of cases, however, the infundibulum ethmoidale has absolutely nothing to do with the development of the frontal sinus.

Does the embryology account for the varying adult relations of the nasofrontal duct and the sinus frontalis, with the structures in the ventral and superior portion of the meatus nasi medius? To this question I must give an affirmative answer, because I think that careful analyses of this region in a series of adult specimens justify our embryologic conclusions.

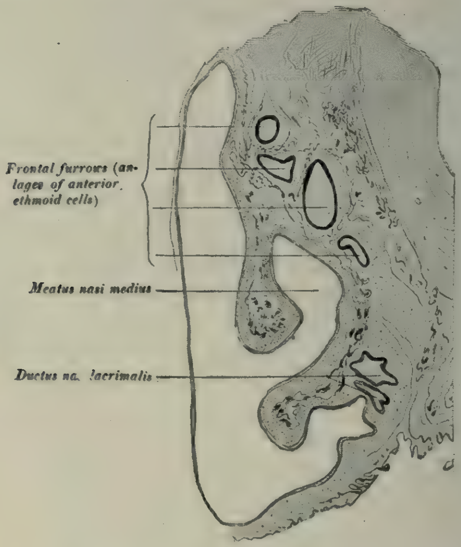


Fig. 44 (× 3.9) Drawing of a frontal section through the nose of a term fetus (series D, slide 4). The frontal furrows have pouched towards the frontal region and have established early anterior ethmoid cells. The frontal recess is obliterated by the coalescence of the frontal folds with the lateral surface of the concha nasalis media —compare with fig. 36 B.

It will doubtless aid in making the adult conditions one meets more comprehensible if we here refer to specific fetal conditions. In fig. 41 the infundibulum ethmoidale is in line with the third frontal furrow, but not directly continuous with it. If in this case the frontal sinus should develop from the anterior ethmoid cell of the first or second frontal furrows, or from the frontal recess directly, the nasofrontal duct of the adult sinus would doubtless communicate directly with the meatus nasi medius and not with the infundibulum ethmoidale. If, on the other hand, the frontal sinus should develop from the cell of the third frontal furrow, the nasofrontal duct would practically be continued down to the infundibulum ethmoidale, but not *directly* continuous with it, *unless the bridge of intervening tissue were resorbed* as it frequently is. A frontal sinus developing from the cell of the third frontal furrow would in all probability have a tortuous nasofrontal duct, this of course depending largely on the disposition and size of the other anterior ethmoid cells.

In the specimen shown in fig. 38 the infundibulum ethmoidale and the first frontal furrow are practically continuous with each other. Should the frontal sinus develop from the first frontal furrow in such a condition, the nasofrontal duct would of course be directly continuous with the infundibulum ethmoidale in the adult. We can not say, however, that in such a condition, the sinus frontalis develops from the infundibulum ethmoidale. From adult relations it would appear as if the latter interpretation were correct; embryology, however, shows the error of this contention. If in the specimen shown in fig. 41 the frontal sinus formation should take place from the cell of the second frontal furrow, the nasofrontal duct would be continued down to the infundibulum ethmoidale at an angle, but not be directly continuous with it. In the specimen shown in fig. 43 (from a child aged 14 months) we find the whole frontal recess extending and developing into the frontal sinus. In the latter case the adult sinus would in all probability have no true nasofrontal duct, but the sinus would open directly into the ventral and superior portion of the meatus nasi medius.

Note the possibilities of adult relations in the fetal specimens shown in figs. 39 and 40. In the specimen shown in fig. 41 the infundibulum ethmoidale might continue its development or pouching lateral to the frontal recess and frontal furrows and thus form the frontal sinus. The aforementioned conditions are met with in the adult nose, and all may be accounted for by studying the varying fetal condition. In a general way we may say that, when the frontal sinus develops from an anterior ethmoid cell, the adult sinus will have a nasofrontal duct—the tortuosity of the duct depending upon the cell from which the sinus developed and upon the degree of development and the disposition of the other anterior ethmoid cells. On the other hand, when the frontal sinus develops by a direct extension of the frontal recess there will in all likelihood be no true nasofrontal duct. Occasionally the adult frontal sinus has two nasofrontal ducts. This is explained by the fact that the sinus at times develops from two anterior ethmoid cells. In many instances the frontal sinus is in reality nothing other than an extensively developed anterior ethmoid cell.

THE CELLULAE ETHMOIDALES.

The ethmoidal cells all develop from preformed furrows or recesses. They are nothing but extensions from some of the meatus nasi directly, or from the accessory recesses and furrows of the meatus nasi medius and superior. From the frontal furrows of the recessus frontalis, and from the furrows of the descending ramus of the meatus medius, the anterior group of ethmoid cells develop. From the ventral and superior extremity, and the superior and inferior recesses of the meatus superior; and the meatus suprema I, the posterior group of ethmoid cells develop. The anterior group have, therefore, their ostia opening inferior to the attached border of the concha nasalis media, and the posterior group have their ostia opening superior to it. The so-called middle group of ethmoidal cells are thus classed with the anterior group, and the term "middle ethmoidal cells" is dropped. This I think is a better classification because the cells of the bulla are closely associated with the cells of the frontal recess.

The lateral masses of the ethmoid bone and its appendages, such as major and accessory conchæ, are primitively solid structures. Later, however, the lateral masses become more or less honey-combed or labyrinth-like by the developing ethmoidal cells. The ethmoid cells, while primarily confined to the lateral ethmoidal masses, frequently extend beyond these limits into the concha media, the processus uncinatus, and the agger nasi. The bulla ethmoidalis is practically always shell-like, due to a cell or cells. Anterior ethmoid cells may develop far into the frontal region, and in many cases might be classed as frontal sinuses. In some adult specimens in which two large sinuses are present on the same side of the frontal region, it is difficult to say whether they are both frontal sinuses or extensively developed anterior ethmoidal cells. Developmentally, in many cases, they are ethmoid cells, and topographically they should be classed as frontal sinuses. Occasionally the posterior ethmoid cell which develops from the meatus nasi suprema I extends into the sphenoidal sinus. The superior and the supreme conchæ usually become more or less shell-like in the adult, due to the developing posterior ethmoid cells.

In the formation of the ethmoid labyrinth there is no uniformity. In a general way the anterior group of ethmoidal cells is ventral to the posterior group. There is, however, at times, considerable overlapping of the two groups. Each cell as it grows from a preformed furrow or recess tends more or less towards the cribriform plate of the ethmoid bone. Even though a certain cell has its anlage-point farther inferior than another cell, it may outgrow its neighbor and force the latter to progress in a direction other than to which it was primarily directed. Later the cells in the honeycombing of the lateral ethmoidal masses grow in almost any direction. Sometimes the intervening walls break down and larger single cavities are thus formed. Seydel very aptly says: " . . . die Zellen der verschiedenen Reihen stehen gewissermassen im Wettkampf mit einander, bald überwiegen die der einen, bald die der anderen Reihe. Daher verlaufen die Trennungslinien zwischen den Reihen keineswegs immer genau wie die Muschelursprünge."

THE SINUS SPHENOIDALIS.

Of the sinus sphenoidalis little need be said in this paper. It is primitively nothing but a constriction from the dorsal and superior portion of the nasal fossa, a fact already pointed out by Dursy. This constriction of the nasal fossa in the formation of the anlage of the sphenoidal sinus is evident fairly early, and at birth the sinus is comparatively well advanced in most instances.

Its further development depends, of course, just as in the other sinuses, upon the simultaneous growth of the sac and the resorption of bone. In this manner the sphenoidal cavity becomes well established in the body of the sphenoid bone.

In the frontal section shown in fig. 20 we have represented the manner of constriction of the superior and dorsal portions of the nasal fossæ in the formation of sphenoidal-sinus anlages. Later the sinuses are represented by very shallow pits and by the 5th month of extrauterine life the sinuses are well established (fig. 42).

V. Some Later Developmental Changes on the Lateral Wall as Presented in the Adult Nose.

It is not necessary to consider the adult lateral nasal wall in detail since the general anatomy is so well known, and besides the descriptions of the late fetal conditions as given, would in a measure be duplicated in a detailed description of the adult lateral wall. There are, however, certain conditions and relations of great importance which develop much later, and varying opinions are entertained on some of these points. We will, therefore, in subsequent paragraphs consider the later developmental changes with especial reference to: (1) the number of ethmoidal conchæ in the adult; (2) the ethmoid cells with especial reference to their ostia; (3) the ostia maxillaria; (4) the relations of the nasofrontal duct with especial reference to the manner of communication of the frontal sinus with the meatus nasi medius.

THE NUMBER OF ETHMOIDAL CONCHAE IN THE ADULT.

In previous paragraphs we dwelt at some length on the number of ethmoidal conchæ that are differentiated before birth. We found that the number varied from three to five; with four major conchal folds in the ethmoidal region rather common, and five not at all unusual. The concha suprema III early loses its identity in the vast majority of cases. This is also true of the concha suprema II; however it is as a rule somewhat farther delayed. The question naturally arises: how far does the reduction in ethmoidal conchæ progress? and what is the average number of conchæ in the adult in a large series of specimens?

Naturally in the cases where the meatus suprema I is very shallow and short, it becomes a personal equation as to whether the shallow furrow should be considered as a meatus or merely as a groove on the medial surface of the concha superior. In one case it means an extra concha; in the other the whole ethmoidal mass, superior to the concha media is considered as the concha superior. This is doubtless the reason why writers differ so widely in their results. Again, the accessory concha in the meatus superior, when well developed, is at times erroneously considered as the concha superior. This, of course, leads to divergent results as to the number of ethmoidal conchæ that are present in the adult nose.

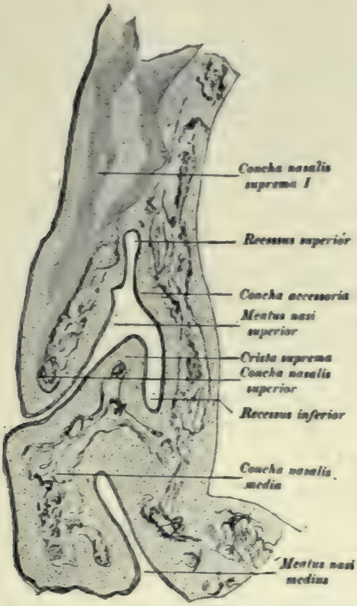


Fig. 45 (× 10) Drawing of a frontal section through the lateral wall of the nasal cavity of a 7-months fetus (series C, slide 8). The section is in the region of the accessory concha of the superior meatus. It shows the well developed "crista suprema" of the concha media, also the marked curling of the latter concha.

Zuckerkandl in "120 Kopfhälften" of adults found two ethmoidal conchæ in 24 of them, and three ethmoidal conchæ in 96 of them. In this number he found his "mittlere Siebbeinmuschel operkulisiert" in 11 instances. According to some of his figures he has at times considered my accessory concha of the meatus superior as his "mittlere Siebbeinmuschel." If we subtract 11 cases from the 96 and add them to the 24, we would presumably have a better ratio for comparison with other results. The accessory concha of the meatus superior is very prominent in some adult noses, and a large number of specimens show at least a rudimentary accessory concha.

The fourth annual report of the committee of collective investigation of the Anatomical Society of Great Britain and Ireland, gives the following results: Out of 152 observations, 3 cases are reported with but one ethmoidal concha; 85 cases with two ethmoidal conchæ; 62 cases with three ethmoidal conchae; and 2 cases with four ethmoidal conchæ. This report is the result of fifteen subreports from as many different schools, with presumably a larger number of observers. It is, therefore, difficult in such a report to have uniformity in observation because, as stated before, the personal equation as to what should be considered a concha in the cases where the differentiation is slight, is obviously great. The report shows that in a few instances the reduction in ethmoidal conchæ has progressed but little. The number of times that three ethmoidal conchæ are present in the adult nose is rather low in the above report, as compared with the statements of other observers. Unless one continually remember the late fetal conditions, he is apt, in many cases, not to recognize the concha suprema I in the adult nose, *i. e.*, when the concha is very rudimentary.

I recently examined 120 adult lateral nasal walls, with especial reference to the number of major ethmoidal conchæ. I found that 75 specimens presented three ethmoidal conchæ, and the remaining 45 specimens but two ethmoidal conchae. A few of the specimens were suggestive of having four ethmoidal conchæ. I find that the ostium of the ethmoidal cell which develops from the meatus suprema I is very often a good point for orientation in determining the presence of a concha suprema I (adult).

According to Zuckerkandl's series and the series I examined, we should consider the adult ethmoidal region as usually presenting three ethmoidal conchæ rather than two.

THE ETHMOID CELLS AND THEIR OSTIA.

In a previous paragraph on the anlages of the ethmoidal cells we divided them into two groups—anterior and posterior. All those cells that have their ostia opening inferior to the attached border of the concha nasalis media may be designated as anterior ethmoidal cells; and those that have their ostia opening superior to the attached border of the concha nasalis media may be designated as posterior ethmoidal cells. The anterior group are in a general way ventral to the posterior group; however there is at times considerable overlapping of the two groups.

The posterior group of cells. The posterior group of cells communicate with the meatus nasi superior and suprema I. The latter meatus is present, according to my specimens, in 62.5 per cent of cases; and 75 per cent of the positive specimens have a posterior ethmoid cell opening into this meatus. In some instances the cell which opens into the meatus suprema I is very large and it may encroach upon the lumen of the sphenoidal sinus. Rarely two posterior ethmoidal cells communicate with the meatus suprema I.

It is a constant condition to have posterior cells opening into the superior meatus. According to my specimens we invariably have a posterior ethmoid cell opening at the superior and ventral extremity of the superior meatus. The latter cell very frequently extends into the body of the concha media, and at times is excessively large. In previous paragraphs we spoke of an accessory concha of the superior meatus. We will recall the presence of recesses, inferior and superior to the latter concha—these recesses early giving evidence of cell-anlages. If we carefully look over a series of adult specimens we will in many cases see evidences of this accessory concha, which at times is well formed. Since the fetus gave evidence of developing cells from the two recesses mentioned we would in the adult expect to find ostia of posterior ethmoidal cells in these positions. Twenty-six per cent of my specimens showed a posterior cell opening in the position of the superior recess, and in 50 per cent of cases a posterior cell opened in the position of the inferior recess.

To recapitulate: The posterior ethmoidal cells open into the meatus nasi superior and suprema I. The latter meatus is present in 62.5 per cent of adult cases, and in 75 per cent of instances this meatus has a posterior ethmoidal cell communicating with it. The superior meatus has in 100 per cent of cases a cell communicating with it at its ventral and superior termination. The superior meatus has also in 26 per cent of instances a cell opening into the superior recess, and in 50 per cent of cases a cell opening into the inferior recess.

These adult conditions justify our conclusions with reference to cell-anlages in the fetus and young child.

The anterior group of cells. It will be recalled that we referred to anlages of anterior ethmoidal cells in both the ascending and descending rami of the meatus nasi medius, *i. e.,* in the regions of the bullar furrows and the frontal recess. If now we examine a series of adult specimens we will notice in the positions of the former cell-anlages that we now have ostia of cells. My series of specimens indicate that in 100 per cent of cases anterior ethmoid cells have their ostia in the position of the suprabullar recess or furrow. The cells that open in this position vary in number from one to three. They are directed variously behind the bulla ethmoidalis, thus causing the latter structure to be hollowed out and shell-like and at times excessively large. Some of the cells with their ostia in the position of the suprabullar recess may also be directed towards the cribriform plate or towards the frontal sinus. I find in 13 per cent of instances that there is an ostium on the medial surface of the bulla ethmoidalis, or in the position of the original bullar furrow (fig. 31). In 11 per cent of cases an ostium is found in the position of the infrabullar furrow. The cells that communicate with the middle meatus in the location of the latter two places are usually very small.

The anterior ethmoidal cells that develop in the region of the ascending limb of the middle meatus, *i. e.*, in the region of the frontal recess, are very variable in size and position. The number of adult cells depends largely upon the degree of differentiation of frontal furrows in the fetus. Some of the cells in this position open directly into the middle meatus, others into the superior and ventral extremity of the infundibulum ethmoidale. Some also open into the suprabullar recess. Some of these anterior ethmoidal cells may extend towards the frontal sinus so that it is difficult to say whether the cavity is that of a frontal sinus or that of an anterior ethmoidal cell. The ventral and superior end of the infundibulum ethmoidale also frequently expands into an anterior ethmoidal cell, which at times is large.

THE CONCHAL AIR CELLS.

As was stated in a previous paragraph there is no uniformity in the development and arrangement of the cells of the ethmoid labyrinth. It will be recalled that the cells develop from preformed furrows, and that the former gradually extend into the lateral masses of the ethmoid bone. In this manner the lateral ethmoidal masses which were primitively solid structures become more or less labyrinth-like as age advances. The individual cells are usually separated by thin osseous plates, or as in some adult cases, merely by mucous membrane —the bony partition having been resorbed. Again the intervening walls may be entirely gone and one or the other group of cells may be replaced by a large cavity. Many of the ethmoid cells are completed by the articulation of the ethmoid with neighboring bones.

These cells in many cases are not confined to the limits of the lateral ethmoidal masses. They hollow out the superior and supreme ethmoidal conchæ so that in the adult these conchæ are merely thin shell-like medial boundaries of posterior ethmoidal cells. The cells also at times extend into the sphenoïdal sinuses, and also encroach upon the lumina of the frontal sinuses. Should the intervening walls break down we would have established a communication between either of the sinuses and certain of the ethmoidal cells. Ethmoid cells very frequently extend into the ventral extremity of the concha media, into the ventral extremity of the processus uncinatus, and into the agger nasi. The bulla ethmoidalis is almost invariably shell-like because of air cells. At times the concha nasalis media contains multiple air cells or it may contain a very large single cell which causes the concha to look bleb-like. It is very common for the posterior ethmoid cell which develops from the ventral and superior extremity of the meatus nasi superior to extend beyond the limits of the lateral ethmoidal mass into the concha media. Sometimes a cell develops from the so-called sinus of the concha media, which more or less hollows out the ventral extremity of the concha. Anterior ethmoidal cells may also extend into the concha media. The cells that extend into the agger nasi and processus uncinatus may communicate either with the meatus medius directly or with the superior and ventral extremity of the infundibulum ethmoidale. The concha nasalis media at times curls laterally and superiorly and thus forms the so-called sinus of the middle concha. This curling is, however, not extensive as a rule and the area included by it always opens freely into the middle meatus. It is usually unimportant.

These conchal cells have led to conflicting and some erroneous theories as to their genesis. They surely are nothing other than ethmoidal cells which have developed beyond the limits of the lateral ethmoidal masses into the appendages of the masses, *i. e.*, into the conchæ. Occasionally a cell develops into the concha media which has its anlage-point on the lateral surface of this concha (figs. 34 and 35).

These conchal cells may become the seat of pathologic conditions, just as do other paranasal chambers, but the cells do not in any manner owe their origin to such conditions. For a further consideration on conchal cells the reader is referred to a previous paper by the writer bearing directly on these cells.

THE OSTIA MAXILLARIA.

In this connection little need be said about the ostium maxillare. In the adult it of course is in the position of the primitive sinus maxillaris, *i. e.*, the adult ostium corresponds in position to the evagination of the mucous membrane in the infundibulum ethmoidale for the formation of the anlage of the sinus maxillaris. The formation of the ostium maxillare was, therefore, considered in previous paragraphs and nothing further need be added here. While the ostium maxillare may be primitively double, *i. e.*, the anlage of the sinus maxillaris may be represented by a double pouching, it (the ostium) at times becomes duplicated later in life. This latter duplication of the ostium needs to be considered since certain later developmental processes are involved. Very frequently there is also an ostium present in the adult nose which communicates directly between the sinus maxillaris and the meatus nasi medius. This ostium is not present in the fetus and young child, hence a later developmental process is here involved. In order to complete the consideration of the various developmental stages of the lateral nasal wall it will be necessary briefly to consider the duplication of the ostium maxillare and the ostium maxillare accessorium.

The ostium maxillare accessorium. In a previous paper I referred to the frequent occurrence of an accessory aperture of the sinus maxillaris. In the same article I dwelt briefly on the theories held by several writers as to the genesis of this opening, and stated that I hoped to study the accessory aperture more extensively in the fetus and child, to see whether the opening, after all, at times, did not have an embryologic significance. Since then I have had the opportunity of examining a larger number of specimens of the lateral nasal wall of the adult, child, and fetus.

This accessory ostium is, as a rule, situated in the membranous portion of the lateral wall of the middle meatus, a short distance above the cephalic and attached border of the inferior nasal concha, at about the junction of its middle and posterior thirds. In some instances the accessory ostium is found immediately dorsal to the infundibulum ethmoidale—occasionally actually extending into the latter. This accessory ostium is usually single but occasionally it is duplicated, and rarely three accessory apertures are present in this portion of the middle meatus. The aperture must not be confused with the duplication of the ostium maxillare which is located in the depth of the infundibulum ethmoidale; however at times very near its dorsal extremity.

Nathaniel Highmore, who apparently was the first anatomist to describe the maxillary sinus, does not mention anything about this accessory ostium. J. Cruveilhier refers to an orifice in the middle meatus, apparently the accessory ostium of the sinus maxillaris, which he considers the "plus ordinairement *l'orifice du sinus maxillaire.*" Further he says that "Cet orifice semble manquer quelquefois; on le trouve alors au niveau de la partie moyenne de l'infundibulum: on dirait, dans ce cas, que le sinus maxillaire communique directement avec les sinus frontaux et non avec les fosses nasales." He also calls attention to the fact that the maxillary sinus may possess two apertures: "Il n'est pas rare de voir le sinus maxillaire communiquer a la fois et dans le méat moyen et dans l'infundibulum."

From the above we must conclude that Cruveilhier considered the accessory aperture as the more regular ostium of the sinus maxillaris, but recognized that it is inconstant. He erroneously thought that the ostium maxillare, which is constant and communicates with the infundibulum ethmoidale, was not always present, and when it was present, that the maxillary sinus communicated with the frontal sinus and not with the middle meatus. We only rarely have direct communication between the frontal and maxillary sinuses (Cryer, Brophy, and J. P. Schaeffer have reported such cases). While from a practical point of view the frontal sinus communicates with the maxillary sinus in many cases, due to the infundibulum ethmoidale acting as a gutter between the frontal region and the ostium maxillare, we have no right to say that the two sinuses are in communication with each other directly. In all cases the sinus maxillaris communicates indirectly with the meatus medius by way of the hiatus semilunaris. Gosselin, however, recognized that the sinus maxillaris constantly communicated with the "Trichter" (infundibulum ethmoidale). Henle figures an accessory opening of the sinus maxillaris under the name "unbeständige Communicationsöffnung."

Giraldès in 100 cadavers found this accessory ostium "acht bis zehn Mal." Zuckerkandl reports it present "in jedem neunten bis zehnten Falle." Chiari and Hajek found an accessory ostium in every fifth case. Turner found it four times in nine dissections. In a former paper I reported an accessory maxillary ostium present thirty-five times out of 80 specimens examined, or a percentage of 43.75. Three of the specimens presented two accessory ostia, or a percentage of 3.75.

Since the publication of the aforementioned paper my attention was directed to a report (Fourth annual report of the committee of collective investigation of the Anatomical Society of Great Britain and Ireland) which was inadvertently overlooked before. This report covers the examination of 152 specimens. In this number of specimens it was found that 53 per cent of maxillary sinuses possessed but one aperture (presumably the ostium maxillare); 44.1 per cent, two apertures (presumably the regular ostium, and either the duplication of the latter or the ostium accessorium); and 2.9 per cent, three apertures (presumably two accessory ostia besides the regular aperture). The sinus maxillaris communicated with the infundibulum ethmoidale by two apertures (a duplication of the regular ostium) in 17.6 per cent of cases. In this report no mention is made as to what is considered a duplication of the normal aperture. In some cases an accessory ostium is placed immediately dorsal to the infundibulum ethmoidale, in fact is very often continuous with the infundibulum. I imagine that some of the latter cases are included among the 17.6 per cent of specimens. Unless the opening were wholly included within the dorsal end of the infundibulum I considered the aperture as an accessory ostium, communicating directly between the sinus maxillaris and the meatus nasi medius, and not as a duplication of the ostium maxillare proper. With this fact kept in mind the above report agrees closely with the figures in my former paper and also with the results obtained in the following series.

I recently examined 125 adult specimens (including those of my former series) of the lateral nasal wall and found that 53 of them had accessory ostia communicating directly between the maxillary sinus and the middle meatus—a percentage of 42.4. Three of the specimens presented two such openings—a percentage of 2.4.

J. A. Giraldès was apparently the first to consider this opening from a developmental point of view. He came to the conclusion "dass in allen Fällen, wo diese abnorme Oeffnung besteht, sie immer das Product eines pathologischen Vorganges und durch eine wirkliche Perforation zu Stande gekommen ist." He, however, considered this aperture much less common than it is, thinking it present in only 8 or 10 per cent of instances. Giraldès bases his pathologic theory on the fact that he had the privilege of following the "Entwicklungsphasen von der Verdünnung der Schleimhaut des Ganges bis zur volständingen Durchbohrung." Zuckerkandl corroborates the thinning of the mucous membrane, but does not hold to the pathologic theory. The latter author has seen some cases where an accessory aperture was caused by the gradual wearing of a "zugespitzer Hakenfortsatz der Nasenscheidewand," which finally resulted in an opening on the lateral wall of the middle meatus.

While some accessory apertures are obviously due to a pathologic process as suggested by Giraldès, and others are caused in a mechanical manner by spurs on the nasal septum, as suggested by Zuckerkandl, we certainly must look elsewhere in the vast majority of cases to find the genesis of this very common aperture.

I agree that there is a thinning of the mucous membrane in the position of the accessory ostium, but believe that the explanation for this is found in the development of the sinus maxillaris. In infancy the walls of the sinus maxillaris are comparatively very thick. We know that the sinus cavity increases by the simultaneous growth of the sac and the resorption of surrounding tissue, these processes taking place *pari passu* with the growth of the face. In this manner the sinus walls become thinner, up to a limit, as age advances. The thinning out apparently progresses unevenly, as evidenced by the very uneven walls of many adult cavities. On the base or medial wall of the cavity we have an area that is in time composed of merely two layers of abutting mucous membrane, one the mucous membrane of the middle meatus, and the other the mucous membrane of the maxillary sinus. These two layers of mucous membrane with no intervening bone offers very little resistance to the growing maxillary cavity. In time they become so thinned out and attenuated in many instances that ultimately an opening is formed, thus establishing the ostium maxillare accessorium. This reminds one of the early thinning and attenuation and ultimate rupture of the two layers of abutting epithelium—the bucconasal membranes—in the establishment of the primitive choanæ.

If we accept this view, and to me it seems plausible, as to the genesis of the ostium maxillare accessorium, we would not expect to find the ostium in fetuses nor in young children. We would neither expect to find often this accessory aperture in the young adult, *i. e.*, before the twentieth year of age. We would, however, especially look for it in the more advanced adult, after the walls of the sinus maxillaris have been thinned out by the large adult cavity. This is in accord with my results. I have never been able to find the ostium maxillare accessorium in the fetus nor in the child. It occurs, as far as my observations would indicate, only in the adult. I have found it in adults between the ages of twenty and ninety years. It is a very frequent aperture from thirty-five years on. Symington likewise never found the accessory ostium in children. He says: "In children I have never found more than one aperture, viz., that into the infundibulum."

I have, therefore, come to the conclusion that the ostium maxillare accessorium is in most instances established by the developing sinus maxillaris. The growth of the sinus causes the two layers of abutting mucous membrane to become thinned out and attenuated, ultimately resulting in an opening in very many adult noses. Some are doubtless due to a pathologic process, and others produced in a mechanical manner by septal spurs. Enlarged middle conchæ may also wear holes into the maxillary sinus in this position; this is, however, rare.

The duplication of the ostium maxillare. In a previous paragraph I spoke of the double pouching of the primitive maxillary sinus. By the distal fusion of the two pouches the points of evagination would remain as the adult ostia maxillaria, yet the adult cavity would be single. Other duplications of the regular maxillary ostium are doubtless caused in a manner similar to the establishment of the ostium accessorium, i. e., by the attenuation and ultimate rupture of the mucous membrane in this position. The same conditions prevail here as in the position of the ostium accessorium, since it is in the immediate neighborhood.

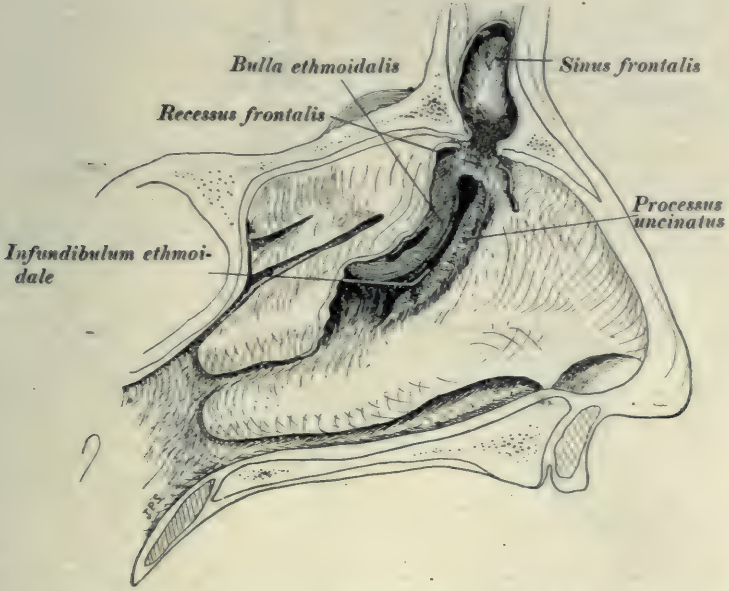


Fig. 46 A semidiagrammatic drawing of an adult lateral nasal wall. The concha nasalis media is represented as partly cut away so as to expose the underlying structures. Note the nasofrontal relations, and that there is no true nasofrontal duct. The frontal sinus presumably developed by an extension of the frontal recess directly. Compare this with the conditions represented in figs. 47, 48 and 49.

THE COMMUNICATION OF THE FRONTAL SINUS WITH THE MIDDLE MEATUS.

We previously considered the early conditions of the frontal recess with especial reference to the frontal furrows found on its lateral wall. Reference was made to the possible points of origin of the sinus frontalis. It now remains briefly to consider the ventral and superior portion of the meatus medius with especial reference to the manner of communication of the frontal sinus with the middle meatus in the adult, to see whether our earlier conclusions on this portion of the lateral nasal wall were justifiable. We previously concluded that the frontal sinus might develop from the frontal recess directly;

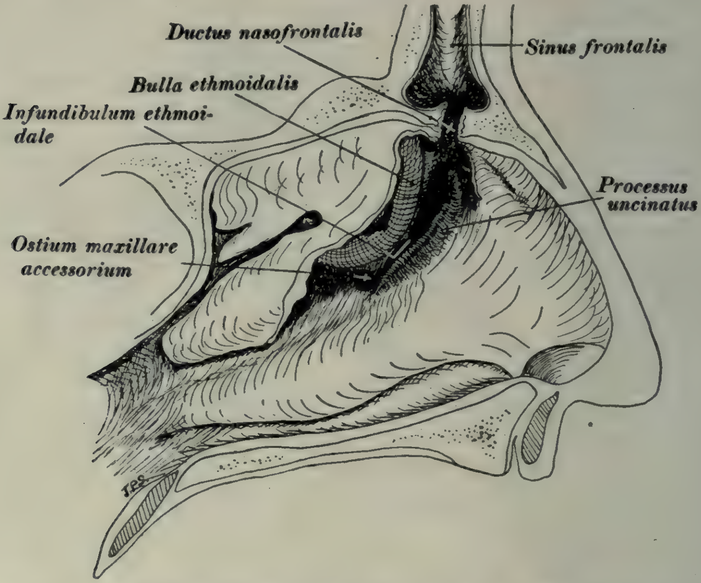


Fig. 47 A semidiagrammatic drawing of an adult lateral nasal wall. The concha nasalis media is represented as partly cut away. Compare the nasofrontal relations with those found in fig. 46. In this case there is a nasofrontal duct which meets the infundibulum ethmoidale at an angle. Some of the secretion from the frontal sinus would find its way directly into the meatus medius, and the remainder would pass into the superior and ventral portion of the infundibulum ethmoidale. The frontal sinus in this case presumably developed from an anterior ethmoid cell.

from one or more anterior ethmoid cells which developed from the frontal furrows; from the recess and a cell; or rarely by direct extension of the superior and ventral extremity of the infundibulum ethmoidale. In figs. 46 to 49 we have semidiagrammatic representations of prevailing adult types of nasofrontal relations.

In fig. 46 the frontal sinus is continued down to the frontal recess, that is, to the ventral and superior portion of the meatus medius. In such a case there is no true nasofrontal duct and presumably the frontal sinus developed by a direct extension of the frontal recess. Note that the infundibulum ethmoidale ends in an air cell and that it is not continuous with the frontal sinus. Occasionally in these instances the infundibulum ethmoidale is carried much nearer to the frontal sinus, and secretion from the latter may drain almost directly into the ventral and superior portion of the infundibulum.

In fig. 47 there is a nasofrontal duct. This represents a very common condition. Note that while the infundibulum ethmoidale is not continuous with the nasofrontal duct it nevertheless meets the latter duct at an angle. Secretions from the frontal sinus would drain partly into the infundibulum ethmoidale and partly into the middle meatus directly. Doubtless the frontal sinus in such instances developed by the extension of an anterior ethmoidal cell that had its origin in one of the frontal furrows.

In fig. 48 we again have the representation of a prevailing condition or type. There is again a nasofrontal duct, but it is not in line with the infundibulum ethmoidale. Practically all secretion from the frontal sinus would drain into the meatus nasi medius. We must here conclude that the frontal sinus developed by an extension of an anterior ethmoidal cell, presumably the cell from the first frontal furrow.

In fig. 49 the infundibulum ethmoidale is continuous with the nasofrontal duct. There are two possibilities of development for the frontal sinus in these cases. In the first place the infundibulum ethmoidale may have continued its development superiorly and ventrally, lateral to the frontal furrows, and then enlarged into the frontal sinus. Another explanation may be found in the fact that the infundibulum ethmoidale may have been continuous with a frontal furrow; if not continuous, the intervening lamella of tissue may have been resorbed and the two channels thus made continuous. *It is not common for the infundibulum ethmoidale to be* DIRECTLY *continuous with the nasofrontal duct.* At first sight it may appear so, but careful dissection will show that, in the majority of cases where intimate relations exist between the infundibulum ethmoidale and the nasofrontal duct, *the two channels meet each other at varying angles.* At times there is actually a slight groove connecting the two channels. We have, however, no right to say that in such cases, the nasofrontal duct is directly continuous with the ventral and superior end of the infundibulum ethmoidale.

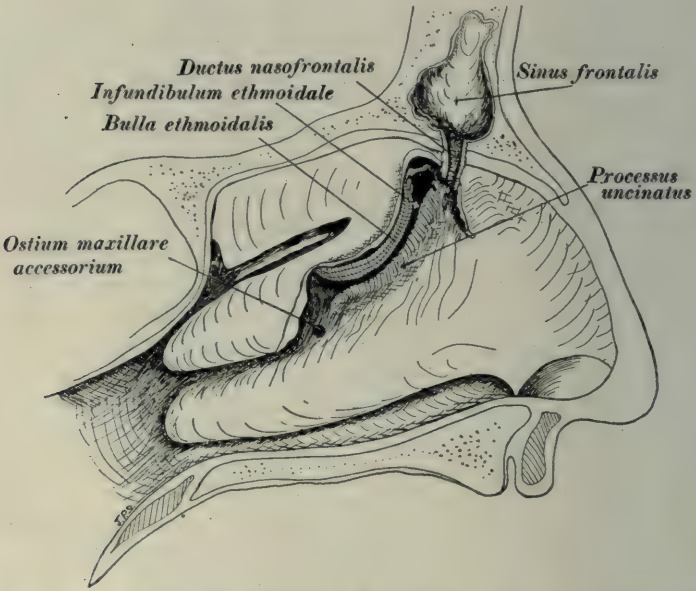


Fig. 48. A semidiagrammatic drawing of an adult lateral nasal wall. The concha media is again represented as partly cut away so as to expose the operculated structures. Compare the nasofrontal relations with those represented in figs. 46 and 47. Practically all of the secretion from the frontal sinus would drain directly into the meatus nasi medius. The frontal sinus is doubtless an extension of an anterior ethmoidal cell.

In fig. 50 anterior ethmoidal cells from two frontal furrows are developed sufficiently to be called frontal sinuses. Both communicate with the frontal recess or the ventral and superior portion of the meatus medius. In such instances the intervening wall may break down and an adult frontal sinus with two nasofrontal ducts will be present. Occasionally we find a frontal sinus with two ducts leading from it, and the above explanation for such a condition seems plausible.

If we take all the cases that fall under the types as represented by figs. 47 and 49, they will include about 56 per cent of my specimens; type, fig. 47, being the much more common of

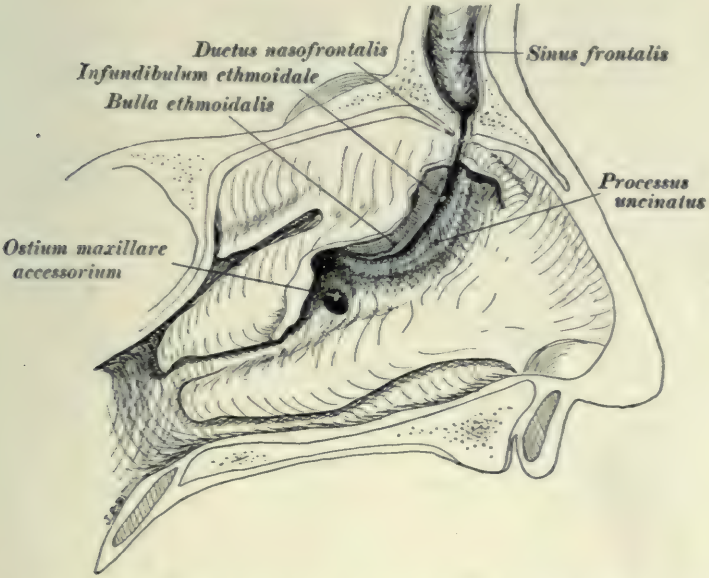


Fig. 49 A semidiagrammatic drawing of an adult lateral nasal wall. The concha nasalis media is partly cut away. The infundibulum ethmoidale is directly continuous with the nasofrontal duct—a condition not common.

the two. In a previous paper these two types were included among the specimens as representing positive fronto-maxillary relations. The specimens falling under the type as represented by fig. 46 will also frequently fall under the above classification. The specimens falling under the type as is represented by fig. 48 will include approximately 40 per cent of my adult specimens. The latter were in a previous paper included among the specimens as representing negative fronto-maxillary relations. Specimens will, of course, now and then differ somewhat from these types, but they will all in a general way fall under one or the other group.

In this manner we can account for two frontal sinuses on one side. We can also account for the so-called absence of a frontal sinus. Should the frontal recess or an anterior ethmoidal cell of a frontal furrow, stop short of the vertical portion of the frontal bone we would of course have a diminutive frontal sinus—in fact no frontal sinus as far as position is concerned. We must, however, remember that the first evidences of the frontal sinus must not be sought in the vertical portion of the frontal bone but in the superior and ventral portion of the meatus medius, *i. e.,* in the frontal recess. The developing frontal sinus may not progress farther than the

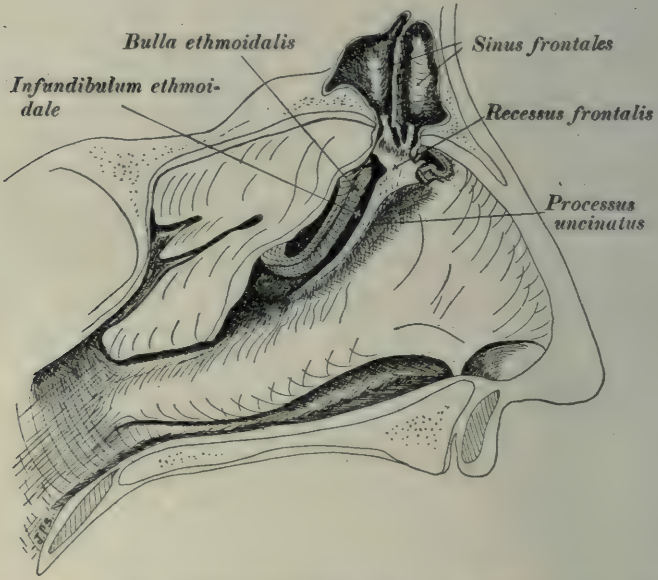


Fig. 50 A semidiagrammatic drawing of an adult lateral nasal wall. The concha media is partly cut away so as to expose for study the underlying parts. It gives evidence of three primitive frontal furrows, viz., two frontal sinuses which doubtless developed from anterior ethmoid cells, and a third cell which extends towards the agger nasi. The region of the frontal recess is well shown in the drawing.

horizontal portion of the frontal bone. The different views held on the presence and absence of the frontal sinus is doubtless due to differences of opinion as to what should be called a frontal sinus, and how far the development must progress towards the frontal region before the cell has reached the dignity of a frontal sinus.

VI. SUMMARY.

1. The nasal anlage establishes itself about the third week of embryonal life as localized thickenings of the ectoderm, located on both sides of the outer surface of the wall of the fore-brain, immediately superior to the primitive oral fossa.

2. During the fourth week the nasal areas become passively depressed, due to an increase in the thickness of the surrounding mesenchyme. In this manner the nasal pits become formed.

3. For some time the nasal pits communicate freely with the primitive oral fossa. The maxillary and the lateral nasal processes abut and fuse with the medial nasal processes, thus separating the nasal pits from the oral fossa.

4. For some time the lines of fusion of the maxillary and the lateral nasal processes with the medial nasal processes are represented by strands of ectodermal tissue. These ectodermal fusion-lines soon disappear ventrally and are replaced by mesenchyme; *i. e.*, the mesenchymal tissue of the maxillary and lateral nasal processes becomes continuous with that of the medial nasal processes.

5. Farther dorsally the ectodermal tissue between the fused maxillary and medial nasal processes does not wholly disappear, but strands of ectodermal tissue remain at the points of fusion. This ectodermal tissue thins out and ultimately ruptures, thus establishing the primitive choanæ.

6. The nasal pits deepen dorsally and superiorly, and in a 35-day embryo the olfactory organ is represented by two blindly ending pouches lying in the mesenchymal tissue above the oral cavity. These blind pouches may be termed the primitive nasal fossæ.

7. The dorsal extension of the blind primitive nasal fossæ continues until the ectoderm of the nasal fossæ meets the ectoderm of the oral cavity. We have now in these positions merely thin membranes composed of two layers of abutting

epithelium—nasal and oral—separating the dorsal portions of the primitive nasal fossæ from the oral cavity.

8. These membranes—the membranæ bucconasales—become attenuated and thinned out, ultimately resulting in rupture. In this manner the primitive choanæ are established, and again a communication between the nasal fossæ and the oral cavity. The primitive choanæ are established approximately from the 35th to the 38th day of embryonal life.

9. When first formed the nares communicate freely with the exterior, but shortly afterwards, in many cases, they become plugged by an overgrowth of epithelium. This plugging may be complete or more or less fenestrated in character.

10. With the formation of the primitive choanæ we have also established the primitive palate, *i. e.,* the portion of the roof of the primitive oral cavity extending from the primitive choanæ to the nares.

11. The palatal processes by fusing along their opposed edges in the median plane establish the definitive palate. In the formation of the definitive palate the nasal fossæ appropriate a considerable portion of the primitive oral cavity.

12. The nasal cavity which is early divided anteriorly by the medial nasal processes, becomes divided into fossæ farther dorsally by the growth and fusion of the nasal septum with the mid-palate line. This division of the nasal cavity into fossæ takes place from before backwards.

13. Coincidently with the formation of the definitive palate the primitive choanæ elongate and ultimately come to occupy the position of, and thus become, the permanent choanæ.

14. The lateral nasal wall is at first extremely simple, and it presents no evidence of its later complexity.

15. The first change on the lateral nasal wall from a more or less even surface is the production of very shallow grooves. The latter appearing inferior and superior to the position of the primitive concha nasalis inferior (maxillary fold). These shallow grooves at once throw into slight relief the greater portion of the lateral nasal wall—the anlage of the concha nasalis inferior.

16. Shortly after the first a second fold appears, outlining the anlage of the ethmoidal conchæ.

17. From three to five ethmoidal conchæ become differentiated before birth.

18. The ethmoidal conchæ in a general way present ascending and descending crura. The ascending crura are, however, in many cases not well differentiated. At times the ascending crura are represented by a general ascending-crural mass, but individual ascending crura are not outlined.

19. The ethmoidal meatuses, including the meatus nasi medius, also in a general way present ascending and descending rami. The descending rami are, however, by far the most marked. In fact many ethmoidal meatuses have no ascending rami. The ascending ramus of the meatus medius is the best outlined. Occasionally the meatus superior possesses a well marked ascending ramus.

20. The integrity of the ethmoidal conchæ and meatuses depends upon the descending limbs rather than upon the ascending limbs.

21. The ascending and the descending rami of the meatus medius present accessory conchæ and furrows which are comparable to structures found in other mammals.

22. The descending ramus of the meatus superior also presents an accessory concha on its lateral wall. It is at times well marked, and again it may be very rudimentary or be entirely wanting.

23. In the region of the knees or bends of the ethmoidal conchæ we frequently find lobules, and on these lobules secondary nodules are occasionally seen.

24. The descending ramus of the concha nasalis media very frequently presents furrows on its medial surface. One of these furrows at times more or less divides the concha into superior and inferior portions.

25. The sinus paranasales all develop from preformed furrows or pits, with the single exception of the sinus sphenoidalis which is primitively nothing but a constriction from the dorsal and superior portion of the nasal fossa.

26. The sinus maxillaris develops by an evagination from the infundibulum ethmoidale. The primitive sinus may be duplicated, in that the pouching is occasionally double. The primitive pouching is at times extensive, including a goodly portion of the infundibulum ethmoidale. These facts doubtless account for the very large ostium maxillare of some adults and the duplication of the ostium maxillare in some cases.

27. The sinus frontalis may develop either from the frontal

recess or from an anterior ethmoidal cell. It may also have a double origin, *i. e.*, from two anterior ethmoidal cells, or from an ethmoidal cell and the frontal recess. Rarely it develops by a direct extension of the infundibulum ethmoidale.

28. The anterior group of ethmoidal cells develop from the frontal furrows of the ascending ramus of the middle meatus, and from the furrows found on the lateral wall of the descending ramus of the middle meatus. The infundibulum ethmoidale at its superior and ventral termination very frequently dilates into an anterior ethmoidal cell.

29. The posterior group of ethmoidal cells develop from the superior and ventral end of the superior meatus, from the superior and inferior recesses of the superior meatus, and from the meatus suprema I. The latter meatus persists in about 62.5 per cent of cases.

30. We should consider the adult ethmoidal region as usually presenting three conchæ rather than two.

31. In the adult the posterior ethmoidal cells open into the meatus nasi superior and suprema I. The latter meatus is present in 62.5 per cent of my adult specimens, and in 75 per cent of instances this meatus has a posterior ethmoidal cell communicating with it. The superior meatus has in 100 per cent of cases a posterior ethmoid cell communicating with it at its ventral and superior termination. The superior meatus has also in 26 per cent of instances a cell opening into the superior recess, and in 50 per cent of cases a cell opening into the inferior recess.

32. In the adult the anterior ethmoid cells open into the meatus medius. According to my series of specimens, in 100 per cent of instances anterior ethmoid cells have their ostia in the position of the suprabullar recess or furrow. The cells that open in this position vary in number from one to three, and are directed variously behind the bulla ethmoidalis. They may also be directed towards the cribriform plate or towards the frontal sinus. I find that in 13 per cent of cases there is an ostium of an anterior ethmoid cell on the medial surface of the bulla ethmoidalis, or in the position of the original bullar furrow. In 11 per cent of instances an ostium of an anterior ethmoid cell is found in the position of the infrabullar furrow. The anterior ethmoid cells that develop from the frontal furrows vary in size, number and position. These cells may open

directly into the middle meatus or into the superior ventral end of the infundibulum ethmoidale. Some of them also frequently open into the suprabullar recess.

33. Ethmoid cells frequently extend into the body of the concha nasalis media, the agger nasi, and the processus uncinatus. These cells also at times encroach upon the cavities of the frontal and sphenoidal sinuses.

34. The ostium of the adult sinus maxillaris is frequently duplicated. This may be due to a double pouching of the primitive sinus maxillaris, or it may be developed later in a manner similar to the formation of the ostium maxillare accessorium.

35. The sinus maxillaris has, according to my series of specimens, an accessory ostium communicating with the meatus medius directly in 42.4 per cent of cases. I believe that this accessory ostium is formed by the developing sinus maxillaris. *i. e.*, the sinus maxillaris developing until the medial wall of the cavity becomes thinned out and attenuated in the position of the accessory opening, until an ostium is formed. The accessory ostium is not present in the fetus nor in the young child.

36. In the adult the sinus frontalis may communicate with the meatus nasi medius in one of the following ways: (1) The nasofrontal duct or the sinus frontalis may open directly into the meatus medius; (2) The nasofrontal duct may be directly continuous with the infundibulum ethmoidale; (3) the nasofrontal duct may be continued down to the infundibulum ethmoidale and meet the latter structure at varying angles; (4) the sinus may have two nasofrontal ducts which in turn may have either of the above relations with the cavity of the nose; (5) rarely the sinus frontalis communicates directly with the sinus maxillaris.

37. In some cases the sinus frontalis has no true nasofrontal duct, but the sinus cavity itself extends well down into the superior and ventral portion of the meatus medius.

38. It is not common for the infundibulum ethmoidale to be directly continuous with the nasofrontal duct. As a rule the nasofrontal duct meets the infundibulum ethmoidale at varying angles. There is frequently a shallow groove connecting the two channels. However, some specimens show that the infundibulum is directly continuous with the nasofrontal duct.

39. If we include the cases in which the infundibulum ethmoidale is directly continuous with the nasofrontal duct, and those in which the nasofrontal duct meets the superior and ventral end of the infundibulum ethmoidale at an angle, they will represent approximately 56 per cent of my specimens. The specimens in which the nasofrontal duct communicates directly with the meatus nasi medius will include approximately 46 per cent of my specimens. The cases in which no nasofrontal duct is present, and those in which two nasofrontal ducts are present are distributed among the above specimens, since they can all be thus classified.

40. From a practical point of view the infundibulum ethmoidale acts as a gutter communicating between the frontal region and the maxillary sinus in 56 per cent of my cases.

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XXI.

ACCESSORY THYROID TUMORS OF THE TONGUE.

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When my attention was first directed to these growths by the advent of my first case, I was surprised to find how little attention had been given the subject by writers in our specialty. The throat books at my command, with the exception of Knight, who dismissed the subject with a few lines, entirely ignored lingual thyroids, and the journals were about as barren. Most of the cases reported have appeared in surgical publications, and have, as a rule, been cases which have come to operation.

My first case occurred in a young lady bookkeeper, 25 years of age, who came to my office on September 16, 1907, complaining of a lump in her throat. She stated that after a visit to her half-brother, who was at the time ill with tuberculous laryngitis, she became nervous about her own throat, and on examining it, discovered a swelling at the base of the tongue, which caused her much alarm. There was nothing in the family history of importance except the half-brother already mentioned; and the personal history was also negative. The patient stated that she had never had sore throat, although her voice had sometimes become a little husky on continued use. She was well nourished, and had every appearance of good health. On examination, a tumor about the size of a large hickory nut was readily seen on protruding the tongue. The tumor was smooth, rounded, somewhat darker in color than the surrounding membrane, and was rather freely covered with blood vessels. On the upper surface was a small bluish spot about one-third of an inch in diameter, which had a fibrous look, and might have been the remains of a portion of the thyroglossal duct, or possibly, a small cyst, exploratory puncture being refused. The growth was painless on pressure, firm and elastic, but giving no evidence of fluctuation, and was apparently not influenced by menstruation.

It was situated immediately behind the circumvallate papillæ, and in contact with the epiglottis below, and gave the appearance of having a perfect right there, the mucous membrane of the tongue extending up over the tumor with no signs of demarkation.

There was no enlargement of the lymphatic glands, nor could the thyroid gland be positively palpated at its normal site in the neck.

This case has been under observation for over three years, and with the exception of some nervousness due to the knowledge of its presence, the patient has had no inconvenience from the tumor, which has remained practically unchanged.

There has been a slight increase in the patient's weight, and the general health has been good.

My second case occurred in an old lady of 79, who consulted me on Nov. 9, 1908, for a subacute pharyngitis and cough following a cold. She made the stereotyped complaint that she had had catarrh for years, but gave no symptoms of a growth, nor was she aware of any. A tumor the size of a chestnut occupied the region of the foramen cecum at the base of the tongue, which had the same characteristics as the case already described, but could be seen only with the laryngoscope. The thyroid gland was apparently present in the neck. This patient recently became choked eating canned corn, and her son, in an attempt to remove the offending body with his finger, abraded the surface of the tumor, causing a rather severe hemorrhage. When I examined this patient's throat a few weeks ago, I found that the intervening two years had produced no change in the tumor, the old lady, now nearly 82, being still unaware of its existence, and in excellent health.

My third and last case, occurred also in a female, the patient being a young woman of 21, employed in a factory, who had been referred to me, January 13, 1909, for a growth at the base of the tongue. This patient had consulted her physician for a cough of two or three months' duration, but up to that time had not been aware of any growth.

An examination of the throat revealed a tumor identical in appearance with the other two, except that it was more deeply placed, arising less abruptly behind the circumvallate papillæ and encroaching more upon the epiglottis. The tumor was about the size of a small hickory nut, and could be seen well only with the laryngoscope. The thyroid gland could not be positively palpated at its normal site in the neck. There has been practically no change in the growth in the last two years. The only throat symptoms have been a tendency to cough and raise, but there has been some nervousness caused by the knowledge of the presence of the tumor. The general health has remained good, with a slight increase in weight.

In none of these cases was any operation done, or required, the only local symptoms being due apparently to the knowledge of the presence of the tumor, and having no effect upon the general health. There was also the possibility, perhaps I may say probability, in the two younger women, that these tongue tumors might be the only functionating thyroid tissue possessed by them.

I have seen two other cases which were undoubtedly cases of lingual thyroid, although the first was shown at the New York Academy of Medicine by Dr. Freudenthal with a doubtful diagnosis. It occurred in a young woman of 21, and exhibited all the characteristics of this unique affection.

The other case was one reported by Dr. Harris, at the New York Academy of Medicine, on Oct. 16, 1910, in a girl of sixteen. This was partially cystic, and a portion had been removed with strong forceps, and found to contain thyroid tissue. The characteristics of this tumor were the same.

One other case, of which Dr. T. W. Corwin has kindly furnished me with notes, was mentioned by him at the time Dr. Freudenthal's case was presented, but which has not been fully published. The patient was an under-sized boy of fifteen, pale and anemic, with tuberculosis in the family history. The chief symptom complained of, was imperfect speech, extending over a period of two years. Examination revealed a tumor occupying the full width of the tongue at its base, and about one inch in its anteroposterior diameter. About two-thirds of this tumor was cystic, and was of a pale bluish gray color, with numerous veins extending from the tongue over its capsule. The operation consisted in the removal of the fluid contents, and a portion of the remainder for examination, which proved to be thyroid tissue. There was in this case, a tumor the size of a hickory nut, in the median line of the neck, which was excised and found also to consist of thyroid tissue. No thyroid gland could be palpated at the usual site.

In 1904 Storrs wrote an excellent and exhaustive article upon lingual goitre, giving notes upon all cases found by him in the literature up to that time, together with two hitherto unreported cases, making in all thirty-two.

I wish to supplement his list by the addition of thirteen cases, and also to add to it, those cases reported since his paper.

HICKMAN: Female child, born alive, but respiration difficult, and lived but a short time. Large tumor could be felt with the finger at base of tongue. Autopsy showed rounded tumor, projecting one-half inch above the tongue, being one-half inch wide and three-quarters of an inch from before backward. It was hard, covered with normal mucous membrane, and pressed the epiglottis over the rima glottidis. Microscope showed glandular follicles and a rich supply of blood vessels.

LUCKE (reported by Merten): Man, 22 years old, had had tumor near hyoid bone from birth, causing annoyance for the past year. Examination showed tumor size of man's fist, with base at root of tongue. Removed by incision from chin to hyoid bone. Histologic examination showed thyroid tissue and colloid material.

PARKER: Girl, 16 years old, with hemispheric tumor, size of a walnut, at base of tongue. It was firm, slightly elastic, and covered with stretched and congested mucous membrane. It was excised, partially recurred, but reduced again in size, causing no inconvenience. Microscope showed glandular tubes lined with cubical epithelium, some containing plugs of gelatinous looking material.

BERNAYS: Girl, 17 years old, with tumor under chin extending to base of tongue, and causing difficulty in swallowing and articulation. The tumor consisted of two parts, one the size of a bantam's egg, and the other the size of a cherry. On the surface of the smaller tumor was a depression a quarter of an inch deep, corresponding to the foramen cecum. The upper lobe projected into the pharynx, and was covered with mucous membrane. The tumors were enucleated through an incision extending from the inferior maxilla to the hyoid bone. Microscope showed nearly normal thyroid tissue.

WOLF: Girl, 18 years old, complaining of difficulty in swallowing, gave history of swelling in throat since an attack of whooping cough six years before. Laryngoscope revealed a firm tumor the size of a nut, on the left side of the tongue, at its base. The tumor suddenly enlarged, and, after tracheotomy, was removed by an incision in the median line beneath the chin. The inferior maxilla was divided, lingual arteries tied, tongue split, and tumor enucleated. The tumor consisted of thyroid gland tissue.

STAELIN: Autopsy of a woman 77 years old, revealed a tumor as large as a walnut at the middle of the base of the tongue. It was hard, covered with normal mucous membrane, and buried in the muscles of the tongue. The tumor proved to consist of normal thyroid tissue.

WARREN: Woman, 52 years old, had had a "lump in her throat" for twenty-two years. It had been of very slow growth, until an attack of grip, when it became swollen and inflamed, producing considerable irritation. Examination showed a tumor about the size of a hen's egg, situated at the base of the tongue, covered with normal mucous membrane, with quite a large tortuous vessel upon it. The tongue was drawn forward by ligatures at the tip, and at the dorsum on either side of the tumor, and the growth easily enucleated through a median incision. Three vessels required ligature. The structure of the tumor proved to be that of the thyroid gland.

BUTLIN (two cases): First case.—Female, 32 years old, afflicted with sore throat, presented a round smooth tumor, the size of a hen's egg, on pulling out the tongue. It was covered with mucous membrane, was elastic, puncture being followed by severe hemorrhage. After tracheotomy the tongue was pulled out, and the tumor removed. There was some recurrence, but no return of the symptoms.

Second case.—Female, 22 years old, with history of having vomited blood occasionally for four years. Had noticed swelling at base of tongue two years before, and it was lanced with much bleeding. Recently she had had difficulty in speaking and swallowing. The tumor was identical in appearance with that of the preceding case, but smaller. Tumor was partly removed by galvanocautery loop, with some return, but not enough to cause inconvenience. Both tumors showed microscopically cystic tubular adenomata of thyroid origin.

GALISH: Female, 24 years old, after the noon meal, having a fit of coughing, raised half a pint of dark blood. Repeated hemorrhages followed, causing a mistaken diagnosis. An accessory thyroid had previously been removed from the neck.

Laryngoscope showed an elastic tumor, the size of a cherry, attached to the base of the tongue, covered with deeply injected mucous membrane. Puncture resulted only in hemorrhage. Tracheotomy was performed, and the tumor was enucleated with much hemorrhage, through a T-shaped incision, the vertical portion dividing the hyoid bone. The tumor consisted of very vascular thyroid tissue.

BABER reported to the Society of Laryngology, at London, October 10, 1894, the case of a young girl 16 years old, who, for nine months, had had a swelling at the base of the tongue. It was removed by the galvanocautery loop, but soon reappeared. The tumor consisted of thyroid tissue, without cysts.

BOND: McIlraith reports a girl of 17, who had noticed a lump in the throat for two months. The voice was a trifle thick, with no other symptoms. Examination showed an immovable, semi-elastic tumor, the size of a walnut, situated close to the foramen cecum. The thyroid was normal. The tumor was removed by raspatory and snare, after cutting the membrane around the tumor with curved scissors. There was profuse bleeding. The structure of the tumor was that of the thyroid gland.

LAKE referred to a case of lingual goitre observed by him, at a meeting of the London Laryngological Society, Oct. 10, 1894, in the discussion of Baber's case.

LYMPIUS: Female, 34 years old, had had for some years a sensation of suffocation and hoarseness, and for two years a swelling at the base of the tongue. This increased in size, causing difficulty in speaking and swallowing. A hemorrhage was followed by increased size of tumor, and bleeding also followed when tumor was lanced. Examination showed a firm growth the size of a walnut, situated at the base of the tongue, pressing upon the epiglottis, and covered with blood vessels. Tracheotomy was performed, the palatoglossal muscles incised, the tongue drawn forward, and the tumor enucleated, accompanied by severe hemorrhage. The tumor was composed of very vascular thyroid tissue.

SELDOWITSCH: Girl, 14 years old, having a round, smooth, firm swelling, the size of a cherry, near the foramen cecum at the base of the tongue, which caused her considerable annoyance. Tumor was removed by galvanocautery loop, and proved to be of thyroid structure. Six months later all the symptoms of myxedema were present. No thyroid could be felt.

KRASKE (reported by von Chamisso): Woman, 37 years old, afflicted with cretinism with complete absence of the thyroid body. Symptoms were disturbance of speech, deglutition and respiration. At the base of the tongue, slightly to the right, was a smooth swelling the size of a walnut, covered with vessels. It was in part, firm, and in part, fluctuating. The operation consisted of tracheotomy, traction on the tongue, and enucleation. Structure was in part embryonic thyroid tissue, and in part ordinary thyroid tissue with colloid degeneration. Four months later symptoms of myxedema were present, and the patient was treated with thyroid extract.

REINTJES reported a case of lingual goitre to the Society of Laryngology, Rhinology and Otology of Holland, May 23, 1898. Man, 25 years old, troubled with severe hemorrhages without apparent cause other than swallowing a large mouthful of food. At the base of the tongue could be seen a dark brown swelling; smooth and elastic, and covered with large veins. Tracheotomy was performed, traction made on the tongue, the anterior pillar of the fauces divided, capsule of the tumor split, and tumor shelled out. The tumor consisted of thyroid substance.

TREITEL reported before the Berlin Medical Society, May 25, 1898, a case of presumable lingual goitre, which had existed for twenty years in a woman. Symptoms slight, and no operation.

LEFFERTS (two cases) casually mentions having observed two cases of goitre at the base of tongue, neither of which has been published.

VAN SELMS observed a woman with a tumor at the base of the tongue which had developed as a sequel to strumectomy.

BENJAMINS reports case of goitre at base of the tongue in a man. True thyroid absent, and operation followed by symptoms of myxedema.

MEYJES reported a case before the Society of Otology and Laryngology of Belgium, June 17, 1899, of a woman, 24 years old, who had had the sensation of a foreign body in the throat since childhood. She occasionally spat up bloody mucus. Examination showed a round, smooth, immovable and painless tumor, occupying the right half of the tongue, at its base. It protruded 2.5 centimeters, and was covered with dilated vessels. No true thyroid could be felt. There was no operation.

SCHADLE (two cases): First case.—Woman, 25 years old; had for the past six months noticed a growth at the base of the tongue, causing her much mental discomfort. There was some impairment and thickness of speech. Examination showed a hard, immovable tumor, the size of an English walnut, covered with a vascular, purplish-red mucous membrane. The tumor became swollen during suppressed menstrual function. Several violent hemorrhages occurred, and the tumor was enucleated through an incision from the symphysis menti to the hyoid bone. The structure was that of the thyroid gland.

Second case.—Woman, 23 years old, who had had a growth at the base of the tongue for ten years. There was lack of resonance to the voice, difficulty in swallowing, and cough. Inspection showed smooth, dense, dusky-red tumor, with characteristic resilient feeling. Operation was refused.

HOLMES reported a case in every respect similar to that of Dr. Schadle. The tumor was partly removed by galvanocautery.

WATSON (two cases): First case.—Woman, 50 years of age, having had "a lump in her throat" for ten years, which recently had enlarged, causing great dyspnea and dysphagia. Examination showed a smooth firm tumor at the base of the tongue, one and one-half inches long, one inch wide, and one inch thick. There was ulceration at the top of the tumor. A part of the tumor was removed by the galvanocautery loop, and found to have the structure of a degenerated thyroid body.

Second case.—Colored girl, 16 years old, complained of "a lump in her throat" five years, which had recently interfered with swallowing. Growth in every way like the preceding case, except that its surface was not ulcerated. The tumor was removed with the galvanocautery snare, and its structure found to be that of the thyroid gland.

ASCHOFF: Female infant, six months of age, with total absence of the thyroid having signs of mild myxedema. Tumor at base of tongue the size of a large pea, composed of numerous small cavities filled with colloid-like glistening contents.

VALLAS: Girl, 20 years old, complaining of difficult swallowing and altered voice. Examination showed an elastic, painless tumor, the size of a small nut, behind the foramen cecum. The tumor was removed twice; the second time through a median incision in the neck, dividing the hyoid bone. Histologic examination showed structure of the thyroid gland.

WAKABAJASKI: Woman, 20 years old, showing for three months progressive pains in the region of the thyroid cartilage, hoarseness, dysphagia, and sensations of a foreign body in the pharynx. An immovable tumor, nearly the size of a pigeon's egg, and covered with normal mucous membrane, was situated at the base of the tongue. Extirpation by the mouth was followed by recovery. Microscope showed goitre tissue.

NARATH is reported as having observed a case of goitre at the root of the tongue.

THEISEN: Woman, 67 years old, had a tumor identical in every way with those reported by Drs. Warren and Schadle. When young the patient had had a well marked goitre, which had now disappeared. Operation was not advised.

LASSIN is quoted by v. Eiselsberg in his monograph on diseases of the thyroid, 1901.

CURTIS and GAUDIER: Woman, 21 years old, complaining of difficulty in swallowing and talking, had had a growth at the base of the tongue for five years. Examination with a laryngoscope showed a round tumor, covered with vascular mucous membrane. It was elastic, almost soft, and imbedded in the muscles of the tongue. The thyroid body was small. The tongue was drawn forward, and a silk suture passed under the mass of the tumor, which not only assisted in drawing out the tongue, but acted as a hemostat. The tumor was enucleated through an incision in the mucous membrane covering. Bleeding was profuse. The structure was that of a typical thyroid gland.

WINSLOW: Girl, 17 years old, complained of difficulty in swallowing, muffled voice, and sore throat. Examination showed a smooth, elastic, ovoid mass, half the size of a hen's egg, at the base of the tongue, between the foramen cecum and epiglottis. Tumor was enucleated through a median incision from the chin to the hyoid bone. Structure was that of the thyroid gland.

TEWELES: Girl, 14 years of age, whose voice had had a peculiar sound for three years, becoming very nasal the last year. Snoring at night was the only other symptom. A tumor, with broad base, covered with normal mucous membrane, was found at the root of the tongue, obstructing the entrance to the pharynx. The tongue could be drawn out sufficiently by strong threads to permit the extirpation of the growth. The microscopic findings were parenchymatous goitre, without colloid, surrounded by a distinct connective tissue capsule. Recovery complete.

SMITH, T. L.: Woman, 48 years of age, who presented a tumor the size of a walnut,, at the base of the tongue, directly back of the circumvallate papillæ. It was covered with mucous membrane highly vascularized, and locally eroded, and was firm, elastic and almost hard. The operation was performed through a mesial incision in the neck, dividing the hyoid bone, and enucleating the tumor in part by blunt dissection. Recovery followed. Microscopic diagnosis was thyroid tissue with mild colloid cystic degeneration.

ONODI: Woman, of 26, who for nine months had suffered from disturbances of swallowing, and more recently, radiating pains toward the ear. A tumor the size of a hazel nut was discovered at the base of the tongue, and was removed through the mouth under local anesthesia. The tumor had a connective tissue capsule, and was found to consist of thyroid tissue, which was largely in a state of colloid degeneration.

GAUDIER and CHEVALLIER: Girl, 20 years old, had had a tumor at base of tongue three years. The tumor was enucleated through a median incision, dividing the hyoid bone. As no normal thyroid gland could be found, a portion was left to avoid myxedema. Section showed thyroid tissue.

GORIS: Gaudier and Chevallier cite an unpublished case, in which myxedema followed the removal of the tumor. The tongue was drawn forward after cutting it from its anterior insertions, and the tumor removed through the mouth.

HANSZEL: Rare tumor at the base of the tongue in a woman 50 years of age, who for 21 years had been suffering from slight impairment of speech, and some respiratory disturbances. A tumor of cartilaginous consistency, the size of a small apple, and entirely filling the faucial isthmus, was found attached by a broad base to the root of the tongue. The submaxillary lymph glands were swollen. A small piece was removed from the crest of the tumor with galvanocautery for examination, and no thyroid tissue found, but as the ablated segment was very small, and especially as the thyroid gland could not be palpated, the case was interpreted as one of lingual goitre.

CRANDON: Girl, 9 years old, who had noticed a growth in her throat for a year and a half. She complained of great dyspnea when in the recumbent position. A year ago an attempt at removal was stopped by severe hemorrhage. Examination showed a smooth, ovoid, elastic growth, the size of a nut, situated at the base of the tongue, and covered with mucous membrane.

RIETHUS: Servant girl, 17 years old, who had been somewhat hoarse for a year, and had had pain and sensation of a foreign body in swallowing for five months. On depressing the tongue a bulging hemispheric tumor could be seen at its base. After preliminary tracheotomy the tumor was easily removed by means of subhyoid pharyngotomy. The operation was followed two months later by symptoms of myxedema. The tumor consisted of colloid thyroid tissue with small cysts.

SMITH, OLIVER C.: Woman, 50 years of age, giving history of growth at back portion of the tongue for seven years, it having twice recurred after removal.

When seen, voice was nearly inaudible, speaking, swallowing and chewing being difficult. Drawing the tongue forward revealed an ovoid tumor at its posterior third, obscuring the epiglottis, and rising nearly to the roof of the pharynx. It was neither painful nor tender. The thyroid gland was apparently normal. Removal was accomplished under cocain, through the mouth, with insignificant hemorrhage, by the ecraseur.

Histologic findings: Accessory thyroid tumor of the tongue.

MIXTER: Woman, 24 years old, had noticed a swelling at the back of the tongue three weeks, which caused no symptoms. Examination showed a mass the size of a small hickory nut, on the dorsum of the tongue, and another the same size under the symphysis of the jaw. The tongue tumor was removed through the mouth, after drawing the tongue forward by strong sutures on either side of the tumor, and was found to consist of thyroid tissue.

ALLEN-INGERSOLL-LUDLOW: The authors report the case of a girl, 18 years of age, who complained of progressive difficulty in speaking, some disturbance in swallowing, and interference with respiration on exertion. Examination showed hemispheric immovable tumor at base of tongue, completely hiding epiglottis and larynx, and covered with normal mucous membrane. The growth was removed by the mouth, accompanied by alarming hemorrhage. Slight paralysis of one side of the tongue followed the operation. Histologic examination showed the tumor to correspond in structure to the thyroid gland.

MURPHY, J. B. (two cases): First case.—Woman, 34 years of age, who had had tumor at base of tongue fifteen years before, when an attempt at removal by the mouth had to be abandoned because of severe hemorrhage. No further trouble was experienced with this growth, but later a submental tumor developed to the size of a hen's egg, which was removed by external incision.

Second case.—Male, 45 years of age, three weeks previous to admission noticed a swelling at the base of the tongue slightly to the left. No symptoms. On removal microscope showed large glandular lumina filled with colloid material. Dr. Murphy advises removal of these tumors by the subhyoidal or submental route.

MEIXNER (two cases): The first case was a girl 20 years old, who complained of pressure in the pharynx for four months. A tumor the size of a chestnut was found at the base of the tongue. It was excised through the mouth after division of the glossopalatine arch, the tongue being pulled forward with forceps. Four months later patient began to have symptoms of impaired thyroid function. The second case was a newborn female infant, born alive, but found drowned shortly afterwards. A lingual thyroid was found at the base of the tongue pressing the epiglottis forward forcibly over the larynx. There was no thyroid at the normal site on the trachea. The microscopic examination showed undoubted presence of thyroid tissue.

EWALD: Meixner refers to a case of lingual goitre which has never been published. Dr. Ewald informs him that while dissecting the cadaver of a child in 1890, during his service at the Institute for Forensic Medicine, he discovered a lingual goitre, the diagnosis afterward being confirmed.

Lenzi: Woman, 42 years of age, presenting two tumors, one hard, smooth tumor in the submaxillary region, and the other the size of an egg at the base of the tongue, giving rise to disturbances in swallowing. Both tumors were enucleated from the outside. On the eighteenth day a postoperative psychosis appeared, with excitement, and persecutory ideas followed by a stuporous condition. Typical myxedema developed at the same time. The microscope showed both tumors to be made up partly of normal functionating thyroid tissue.

Schwarz, D.: Woman, 28 years of age, who stated that when 15 years old she had had a tumor removed from under the chin. For the last year she had had disturbances in swallowing, finally being able to take only liquid or soft food. There was a smooth elastic tumor, the size of a hen's egg, covered with normal mucous membrane, situated in the middle of the base of the tongue, just behind the foramen cecum, partly imbedded in the lingual substance. The tumor was removed by median transhyoid pharyngotomy, with preliminary tracheotomy. The tumor was not outlined by a capsule. The histologic findings showed thyroid tissue, with colloid degenerative changes.

Wikerhauser, T.: Woman, 32 years old, had suffered for two months from pain in swallowing, dyspnea, headache and fever. A tumor the size of a nut was found at the base of the tongue, mostly to the left side and situated in a depression in the muscles of the tongue. The mucosa overlying the tumor was smooth and reddened with dilated veins. No operation was performed, as no thyroid gland could be demonstrated in the neck, and the patient drifted from sight.

Makins: Woman, 31 years of age, suffering from dysphagia and dyspnea, presented a tumor the size of a walnut at the base of the tongue. The tongue was drawn forward, the capsule incised, and the tumor partially enucleated with the finger and blunt raspatory. The tumor was found to have largely undergone colloid degeneration.

Strauss: Woman, 25 years of age, who was suffering from the early symptoms of exophthalmic goitre, presented a globe-shaped tumor the size of a small walnut at the base of the tongue in the region of the foramen cecum. The tumor, which was fairly solid, was removed by external pharyngotomy. The operation proved very difficult, and required the ligation of a well developed venous plexus, and the left lingual artery. Histologic examination showed the tumor to consist partially of normal thyroid tissue, and partially of thyroid tissue in a state of colloid degeneration.

UNGERMANN: Autopsy of a man, 30 years of age, which seemed to show the absence of the thyroid gland from its normal position, and instead, a functionating thyroid tumor the size of a chestnut at the base of the tongue. The tumor was solidly adherent to the neighboring structures, and showed moderate colloid degeneration. There had been no symptoms of lost thyroid function during life.

STIRLING, R. A.: Girl, 12 years of age, who gave a history of progressive difficulty in swallowing and speech. Inspection showed rounded swelling, about the size of a very large marble, placed in the center of the base of the tongue, and projected upward between the fauces. It was covered with very vascular mucous membrane. After preliminary tracheotomy, the tumor was enucleated by the finger and scissors, with very free bleeding. A small thyroid was found to be present in the normal position. Microscopically the tumor consisted of more or less typical glandular thyroid tissue.

PERKINS: Child, 12 years of age, with a peculiar thickness of speech. Examination showed a tumor the size of a hen's egg, situated at the back of the tongue. It was bluish-red in color, elastic to the touch, and freely movable. A rent was made by plunging Knight's nasal forceps through the capsule, and through this a portion of the tumor was enucleated with the finger. The microscopic examination showed thyroid tissue with the presence of colloid material.

STUART-LOW: Woman, 32 years of age, presenting a lingual thyroid after previous removals by the mouth. Laryngotomy was performed, the larynx tamponed, the tongue split from tip to root, and the tumor enucleated with its capsule. The substance of the tongue was so thinned in the vicinity of the tumor that the tongue was preserved with difficulty. The author believes this method superior to subhyoid pharyngotomy, or a galvanocaustic operation by the way of the mouth. The tumor proved to be of a thyroid adenomatous nature.

These sixty-one (61) cases, together with those of Drs.

Freudenthal, Harris and Corwin, mentioned earlier in this paper, comprise all the cases found by a careful search of the literature, and with the three of my own here reported, make a total of sixty-seven cases up to the present time.

Many other cases of aberrant thyroids, which do not come under the title of this paper, have been reported, and one by Gotis has some interesting features. A woman, fifty years of age, fell, and crushed her tongue between her teeth. Soon afterward a tumor developed at the tip of the tongue, rapidly increasing to the size of a large hazel nut. After extirpation the growth was found to possess the same structure as the well-known ulcerating goitres of the cervical region.

When we consider the comparatively small number of lingual thyroids reported, and when we consider the statements of men of unlimited experience and keen powers of observation, like that of our secretary, Dr. Harris, who stated that the case presented by him at the New York Academy last October was the first he had ever seen, we must admit the rarity of this condition. In spite of these facts, however, I cannot help believing that the affection is much more common than has been generally supposed, that many people go through life with this condition unsuspected, and that many other cases accidentally discovered and giving no symptoms, never have been reported.

In vertebrates it is found that the thyroid gland consists rudimentarily of three parts, one mesial and two lateral. The former is derived from the epithelium of the primitive mouth cleft which grows downward as a fold through the approximation of the mesial end of the second branchial arch, with that of the third and the tuberculum impar. This fold, as the neck extends and the large vascular trunks descend, becomes transformed into a tube, the lower blind end of which is capable of producing thyroid gland tissue. This duct, ductus thyreoglossus, passes from the isthmus of the thyroid to the foramen cecum at the base of the tongue, and, normally, is obliterated and becomes a cord of epithelium.

Little is known of the development of the lateral germ, but it is generally assumed to originate from an epithelial accumulation at the posterior wall of the fourth branchial cleft or behind it from the postbranchial organ. In close proximity to this from the anterior wall of the fourth branchial cleft, arises the upper parathyroid body, which relation they preserve, both through their migration and permanently. Views differ as to the behavior of the lateral germ, and it is possible that its development in a normal manner depends upon the influence of the development of the median germ, accounting for the fact that when there is a failure of the latter there is also failure of the former.

Tumors are ordinarily supposed to be without function; but the unique feature of these growths is that they are capable of assisting a disordered thyroid gland, or fully taking its place when that is wanting. There is much evidence to show that the necessity for additional secreting thyroid tissue is in a large measure accountable for their development.

To understand the etiology of these tumors, it is necessary to remember that the thyroglossal duct, or tract, as it is sometimes called, may apparently retain the power of producing thyroid tissue at any portion of its course, the vicinity of the foramen cecum at the base of the tongue being the most favored location. This may take place when there is a functionating thyroid gland in the neck, but what is undoubtedly much more common, is in those cases when the natural thyroid tissue is defective or wanting.

Lenzi believes that these tongue tumors represent the thyroid gland as a whole, it having been fixed in this location in an earlier stage of development. He reasons, therefore, that signs of defective thyroid secretion must follow the radical removal of these tumors, and concludes from a study of the literature, that myxedema has appeared in twenty-two per cent of the operated cases. This is probably approximately correct for the sixty-seven reported cases, but an accurate estimate of the number of operated cases having no other source of thyroid secretion is difficult, for the operations have been performed with all degrees of thoroughness, from the removal of a piece for examination, to the complete extirpation of the tumor. If there had been a radical operation in every case the number of resultant cases of myxedema would unquestionably have been greatly increased.

The normal thyroid gland is present at birth and functionates throughout childhood, but is most fully developed and active from puberty to the menopause. After the latter period the secretion is diminished, and the gland gradually atrophies.

These accessory thyroid tumors of the tongue follow much the same course, and may also be present at birth, or at any age, the oldest recorded case being my own, at eighty-two. The great bulk of reported cases have occurred, however, between the ages of fifteen and forty-five, corresponding to the period of greatest functional activity of the thyroid gland; and here comes an interesting question:

Has the tumor been present from birth in many of these cases, or has it developed only at the time of increased thyroid activity?

It would seem probable that where the normal thyroid was wanting from birth, that the tongue tumor had probably existed from that time, but where the thyroid gland was partially effective at birth or became defective later, the tongue tumor might develop when the additional thyroid secretion was required. In the cases which have been seen late in life it is probable that the growth has existed from the active thyroid period at least. Sex also seems to exert a marked influence; all but six of the sixty-seven cases occurring in females, the exceptions being the cases of Lucke, Reintjes, Benjamins, Murphy, Ungermann and Corwin. In this, also, these tumors follow the inclinations of the thyroid gland, disturbances being much more frequent in females. The situation in brief then is, that the tissue of the thyroid duct at the foramen cecum, retaining the power to develop thyroid tissue, and stimulated by the defect in the normal gland, devolops this functionating tumor, which is perfectly capable of supplying the place of the defective gland, and subject to exactly the same influences.

The diagnosis should be made exceedingly easy by simple attention to the symptoms, or rather lack of them, and the appearance and characteristics of the tumor, particularly when the thyroid gland is absent.

The symptoms of lingual thyroids are mechanical, due to the size and rapidity of growth of the tumor, and nervous, due to the knowledge of its presence. If the tumor is stationary, as it undoubtedly often is, as in Warren's case, where it had been known to exist twenty years; or is of very slow growth, there may be no symptoms, particularly if its presence is unknown to the patient. But if the tumor is large, or suddenly becomes increased in size, there are symptoms of obstruction, a lump in the throat, swallowing, raising, coughing, and in extreme cases, dysphagia and dyspnea. That the mind has much to do with the symptoms in many cases, is readily understood, when we consider the symptoms complained of in cases of imaginary growths in the throat. A young married woman recently came to me, complaining of symptoms far more marked than those of the ordinary accessory thyroid. She was unable to eat or sleep, and had lost twenty pounds in weight since seeing a growth in her throat when examining it herself during a cold. The growth proved to be a rather prominent epiglottis.

These thyroid tumors are very vascular, being supplied by branches of the lingual arteries, and hemorrhages have been in many cases a prominent symptom. Sudden and severe hemorrhages, with no apparent cause, have frequently led to mistaken diagnoses. Only one of the cases of which I have had personal knowledge, has shown this symptom, the old lady already mentioned, whose son injured the tumor with his finger in trying to remove a foreign body.

The appearance of the tumor is very characteristic; a smooth, rounded, painless growth behind the circumvallate papillæ, usually immovable, and, as a rule, firm and elastic, without fluctuation.

The tumor is usually in contact with the epiglottis, but not adherent to it, and there is no enlargement of the lymphatic glands.

The mucous membrane is continuous with that of the tongue, but is usually darker in color and more vascular, and in but two cases (Watson and T. L. Smith) was it eroded. The absence of the thyroid gland confirms the diagnosis. The tumor is usually encapsulated, but this is not always so, as seen in the cases of Schwarz and Ungermann. Ungermann's case, which was of especial interest, occurred at the autopsy of a man 30 years of age, who during life had had no symptoms of the growth, nor of thyroid insufficiency, and whose thyroid gland was proven absent by dissection. It also proved the thyroid gland to be in no way functionally connected with the parathyroids. Microscopically, the accessory thyroids are like the thyroid gland, showing thyroid tissue capable of internal secretions, and a colloid material, which seems to act as a storehouse for some of its activities.

Many of these cases require no treatment, and many others require simply to be reassured, or given simple sedatives. Any remedy of value in disturbances of the thyroid gland would also be of value in disturbances in an accessory thyroid. Lenzi, Stuart-Low, and others, place especial emphasis upon the importance of ascertaining the presence of other thyroid tissue before removing this radically.

Myxedema is not as serious an affection as before the advent of thyroid feeding, but it is still much less to be desired than the average thyroid tumor of the tongue. Whenever urgent symptoms are present the treatment is essentially surgical. There seems to be a wide divergence of opinion as to the best means of procedure for the removal of these growths, but the buccal route would seem as effective, and much less formidable, than pharyngotomy, with or without tracheotomy.

The chief indication is the control of the hemorrhage, and for that reason the galvanocautery and ecraseur have been used. A popular method seems to be to draw the tongue forward by strong traction sutures, with or without severing some of its posterior attachments, and removing the tumor by blunt dissection. Stuart-Low, after performing laryngotomy, split the tongue from tip to base to gain access to the tumor, and considers this the most feasible method, especially in deepseated growths. There have been no reported deaths following operation, but severe hemorrhage has, in a few cases, caused the operation to be abandoned.

CONCLUSIONS.

1. That accessory thyroid tumors of the tongue are more common than has been generally supposed.
2. That they result from nature's effort to supply a physiologic need.
3. That they frequently require no treatment, and should be considered simply as a misplaced thyroid gland.
4. That care should be taken to ascertain the presence of some other source of thyroid secretion before removing radically.

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XXII

REPORTS OF THREE CASES OF MENTAL DERANGEMENT ASSOCIATED WITH SUPPURATIVE OTITIS MEDIA.

By Ewing W. Day, M. D.,

Pittsburgh.

Case I.—The patient is a woman, aged 55, who has been a widow for many years. She is a bright, active, intelligent woman—reserved, sensitive, self-reliant and independent. For some years she has filled the rather difficult position of clerk to a school board, and besides this, she took a very active part in church work and devoted some time to social duties.

February 4th, 1910, she noted that there was some discharge from her ear; but as this seemed rather trifling she did not at first seek medical aid. The discharge persisting, Dr. Sandels was asked to examine her. He did so and discovered a streptococcic otitis media; and fearing the development of mastoid disease, the patient was removed to the Eye and Ear Hospital. Here for several days she was under our observation. It was decided that there was no mastoid trouble and that the disease was confined to the middle ear. During the time she was in the hospital, she got hardly any sleep at night. She was not under hypnotics for fear they might mask her symptoms.

While under observation, the patient was greatly worried over the thought that a mastoid operation might be called for, and still more over the idea (being a sensitive woman) that she might become crippled in her usefulness and become dependent upon others for support.

During the last three or four days at the hospital she became agitated, loquacious and hard to manage. This mental state became more and more pronounced until she developed a maniacal state.

While in this condition she was removed to the Mercy Hospital under Dr. Diller's care. Her condition remained stationary for about two weeks; and then she began to improve somewhat. No attention had been paid to her ears except to have them cleansed several times daily.

Upon admission to the Mercy Hospital, it was noted that she had a "run-around" on one finger. Shortly after admission she developed a swelling the size of the palm of the hand on the buttock; and although it was expected for several days that it would require lancing, it finally subsided gradually and disappeared.

Three weeks after her removal to the Mercy Hospital it was noted there was some swelling over the right mastoid, and an immediate operation was advised; this was done. Pus was found in the mastoid and an epidural abscess was found over the cerebellum. Very soon after the operation the patient's delirium increased. She became disorientated, peevish, faultfinding and quarrelsome. She abused the physicians, nurses and the hospital, and criticized them in the most cutting way. She objected to much that was done for her. Physical restraint became absolutely necessary to prevent her interfering with her bandages. Her mental state made it extremely difficult in every way to manage her. The operative wound did badly. It lay gaping open for about a month and showed no signs of healing. The patient developed irregular temperature and her pulse was weak and slow and her delirium increased. The wound sloughed at the bottom and even appeared gangrenous. For a time it seemed as though there could scarcely be any hope for her recovery.

With the failure of the wound to heal, it was also felt there might be some general systematic blood infection. Accordingly cultures were made from her blood by Dr. Leteve, which revealed the presence of streptococci An autogenous vaccine was made and used in doses of 100,000,000 for six injections. With the use of the vaccines a turn for the better set in. The physical condition steadily improved, but not the mental.

Gradually, very gradually, some slight improvement was noted in the wound. And gradually and very slowly it healed, weeks being consumed in the process. All the while her peculiar mental state, characterized by restlessness, peevishness, disorientation, censoriousness, continued; and nursing of the patient and her management in general were most difficult.

Finally, after many weeks, she had sufficiently recovered to leave the hospital, which she did early in July, about three months after the mastoid operation. At this time the wound was healed and her mental state was much improved, this mental improvement having been of only very recent occurrence. She remained away at two different sanitoria convalescing, and finally returned to the city about October 1st, nearly well. Even after she left the hospital for the sanitorium she had many false conceptions and exhibited some false reasoning, suggestive of a paranoid state. At one time she became so agitated at the sanitorium that her removal was demanded. She was taken to another sanitorium, where she did much better; here her convalescence became uneventful, with full recovery from the mental state.

The following explanation of this case and the relationship of the operation to the mental state appears as the most reasonable one:

A sensitive, delicate, high-strung woman, who is working very hard, making her own living, attending church and social duties, is, while in a state of lowered vitality, seized with otitis media. The otitis media causes in her mental state a subacute and then acute delirium. Her lowered vital tone permits the infecting process in the middle ear slowly to spread to the mastoid. And this same condition of vitality prevents the wound from healing. The behavior of the wound affords ample proof of the fundamental condition—lack of vital tone, lack of resistance to bacterial infection—and more than that, lack of resistance to psychic or mental traumata.

The mental state, it is reasonable to suppose, was brought about by combination of etiologic factors. These were first and fundamental, the lowered or depressed vital tone which naturally affected the mental operations, together with the double traumata of the operation—for it had both its mental and physical aspects. And then to keep up the mental state, which is initiated by the foregoing causes, we have the toxemia from the infection.

So that in this case it would not be correct to say off-hand that the otitis media and operation caused the delirium, and yet it can be seen that they had their influence in producing it. But the point for emphasis is that they produced the delirium only because the patient's general condition amply prepared her for it; it was so weakened that it was unable to resist even a slight assault.

Case II.—L. L. R., male, age 30, referred to me for O. M. P. C.—existing since childhood. An ironworker by occupation, well developed, with no previous history of importance excepting scarlet fever in infancy. For two weeks had had pain in right mastoid with increased discharge of pus and complete facial paralysis on right side. Patient seemed depressed and worried over the prospect of an operation.

The radical mastoid was performed and a necrotic area was found over the facial nerve. After three weeks he left the hospital to be attended by his physician in a neighobring state. The facial paralysis had disappeared and the wound healed well. Returned in one month, complaining of severe headaches, chiefly vertical, sometimes occipital and frontal. Had a marked optic neuritis in right eye. A diagnosis of abscess was made. The patient was much depressed mentally, was fearful of the coming operation, and required the presence of his priest in the operating room. Nothing was found in the brain or dura to indicate either pressure or pathologic changes. For a couple of weeks after, he seemed like the average patient. The optic neuritis partially cleared. Then he again showed depression, having many imaginary ills. Complained of immoral conduct of his nurses, and had other delusions.

He was seen by Dr. Diller and found to be in the condition of dementia which should probably be classed as one of dementia precox. He was taken to St. Francis Hospital. Here he exhibited mutism, disregard for his surroundings, with lack of initiative and desire, which seemed to label him pretty clearly as a case of dementia precox. The patient remained at the hospital for many weeks without showing any substantial signs of improvement, although during his stay there the wound healed.

Here again is a case of a grave form of insanity, apparently chronic in form, caused by operation on the mastoid. Here again it may be safely assumed that while the operation was in all probability the precipitating cause of this grave mental state, yet it is also safe to assume that it was only the precipitating factor operating upon a man whose general organism and mental makeup were fully prepared for giving expression to such psychosis. In other words, any other trauma, physical or mental, we may suppose would have set up such a psychosis. We need not expect such an outcome in persons of ordinary health. Yet it must be confessed in this case such a predisposition could not be discerned before operation.

And it may be here stated that in any case where delirium is produced by operation, we may be pretty sure it so happened only because of the fact that the patient had somehow been prepared for it by a depressed psychic tone. A question of practical importance arises here. Where there is reason to suspect the probability of mental breakdown in a case where serious operation is indicated, it becomes the part of prudence in the surgeon to consider this possibility.

The next case is in direct contrast in physical and mental makeup to case I.

Case III.—A man, aged 52, of stolid appearance, phlegmatic temperament, one not easily susceptible to mental impressions.

He was brought to my office October 18, 1910, complaining of pain in the right side of his head. He had lately shown mental derangements.

Personal history: Negative.

Present illness: In March the patient had an acute suppurative otitis media complicating grip. The discharge was very free, but the patient suffered very much, early in the attack, from severe pain in the ear and frequent spells of dizziness. Occasionally there was some vomiting. The ear continued to discharge for one month. Since then there has been no discomfort directly referable to the ear, but the patient has complained almost constantly of some headache on the right side.

Early in October the headaches had increased until a week before seeing him they were so severe that sleep could only be obtained under opiates. With the increase of pain, an irritable temper and mental hallucination developed. He had to be watched for fear of suicide, which he threatened, and tried at one time to throw himself from an upper window.

He entered the hospital October 20, 1910, and was examined by Dr. W. K. Walker as to his mental condition, who made the following report:

Patient was examined by Dr. Walker two hours before operation. With the exception of cephalic pain which, according to the patient's statement, was most marked over the entire right side, no localizing symptom could be elicited. He was well orientated in all three spheres—time, place, and personality (no delirium), and there was no more marked dulling of the mental faculties than that which could be explained by long-continued suffering (irritability).

He presented the picture of a man who was suffering intense pain, with apprehensiveness and anxiety as to further suffering, greater than he could bear.

He explains his more marked agitation of the night hours as follows:

"Either the pain gets worse at night, or else I am less able to bear it; I can't sleep, so I walk the floor; and if I said I'd throw myself out of the window, I meant that if the pain can't be stopped I'd rather be dead."

Examination of the ear showed there was no discharge, the membrane was intact with injection of the vessels. There was one point of tenderness about one-half inch below and behind the antrum.

X-ray showed the right mastoid to be opaque.

10-20-10. Mastoidectomy was done one hour later. No pus or necrosis was found in the mastoid, antrum, or middle ear. The sinus was uncovered, and while the wall of the sinus did not appear unhealthy, there was a peculiar yellow tint that made an exploratory puncture seem to be indicated. The sinus was found to contain a well organized clot extending from half way to the torcular to the jugular bulb. No return flow being obtained from the bulb, the bulb was opened and curetted, followed by ligation of the jugular vein.

Unfortunately, the specimen of the clot was lost before reaching the laboratory, so whether it was infective or sterile is unknown. As the clot was well organized and firm, showing no signs of breaking down, it was probably the latter, or the infecting organism had become greatly attenuated.

The interesting clinical feature of the case is the entire absence of all the clinical symptoms of thrombosis, with the exception of the infrequent one of pain, and pain of such severity that the patient's mental condition was questioned.

Following the operation the patient's temperature never was above 100; he had decreasing pain for two days, which then disappeared. Otherwise his convalescence was uneventful.

XXIII.

SUBDURAL DRAINAGE IN PURULENT MENINGITIS AND BRAIN ABSCESS. REPORTS OF TWO CASES WITH AUTOPSIES.

By Ewing W. Day, M. D.,

Pittsburgh.

Case I.—Mr. C., aged 30, white, consulted me for the first time December 6, 1910, for pain in and around the right ear and severe periodical headaches.

Family history—Good.

Personal history—Outside the ordinary diseases of childhood, he had always enjoyed good health. At the age of two and a half years, he had scarlet fever which left him with a chronic suppurative otitis media of the right ear. Except for the discharge and gradual loss of hearing, he suffered no discomfort from the ear.

Present history—Four months before he consulted me, he suffered severe pain in the ear and right side of his head. The pain continued for about three days, during which time there was some decrease in the amount of discharge. Following this attack, he suffered frequently from vertigo. In December he had a similar attack and it was at this time I saw him. He referred his pain to the mastoid region. Examination of the ear showed the usual destruction of an O. M. P. C.

Examination of the labyrinth was as follows:

1st. No spontaneous nystagmus.
2nd. No spontaneous nystagmus behind opaque glasses.
3rd. Absence of nystagmus by quick head movement.
4th. Caloric reaction negative.
5th. Turning reaction active.
6th. Hearing, deaf.
7th. Romberg test, positive. No marked direction.
8th. Some tinnitus.

Operation was advised, but although warned of the possibility of brain complications, he refused to consider it. The next few days his pain, which had been localized to the mastoid, increased.

He was admitted to the Eye and Ear Hospital December 12, 1910. At this time physical examination was negative. T. P. R. normal, reflexes normal, and no change in the eyegrounds. The next day, under ether anesthesia, a radical mastoid was done. Before the patient left the table a lumbar puncture was made. There was a slight increase in pressure, the fluid was slightly cloudy, first clear. Microscopic examination showed pus cells in abundance and pneumococci. The day following the operation there developed a very marked nystagmus to the right (the diseased side) and slightly rotary in character. This nystagmus with the labyrinthine tests was typical of labyrinthine empyema and cerebellar abscess, as described by Barany. It was decided not only to drain the dura but also to open the labyrinth and explore the cerebellum. There was no Kernig's sign present, reflexes normal, but there was a marked myotonia.

Operation.—Chloroform anesthesia. Enlargement of the former opening. The cochlea, vestibule, and semicircular canals were opened and pus and granulation tissue found in all. The dura over the posterior lobe of the cerebrum and the anterior surface of the cerebellum was exposed and incised and subdural drainage of silk-gut introduced. Considerable fluid drained from both openings. An abscess on the anterior surface of the cerebellum in close proximity to the internal auditory canal was opened and about a dram of pus escaped. Lumbar puncture—40 cc. of spinal fluid was removed and replaced with 40 cc. N. S. S.

Dec. 15, 1910. Nystagmus undiminished. No headache.

For four days there was a decided improvement in the patient. During the twenty-four hours there was considerable drainage from the dura, the amount gradually diminishing. Pus still drained from the cerebellum.

Dec. 18, 1910. Patient seems stupid, complains of severe headache and there is some rigidity of the neck.

Dec. 19, 1910. Patient still worse. Temperature 102, respirations irregular, and delirium. Nystagmus unchanged.

Operation—Further exposure of the cerebellum with a view if possible of getting better drainage.

There was, however, no improvement and the patient became gradually worse. He was delirious most of the time, the temperature was between 101 and 102, and the respirations were Cheyne-Stokes in character. He died December 22, 1910.

Postmortem report by Dr. Willetts:

Report of partial autopsy on body of young male adult. Behind right ear is operation wound in lower part of which drain is still present. Wound partially healed. On opening skull this external opening is found communicating with a small abscess cavity in the right lobe of the cerebellum and also with a smaller pus focus in the posterior and lower part of the right temporal lobe. About this region there is no exudate, but over the entire left lobe of the cerebellum there is marked purulent exudate in the leptomeninges. This exudate is also seen over the base of the brain and extending down in the meninges of the cord.

Cultures were sterile. Body had been embalmed with solution of formalin and this probably accounts for sterile condition.

The following points are of interest:

1st. A beginning meningitis present at the time of operation, with no clinical symptoms other than would be expected from the ear conditions, and but for the lumbar puncture made at that time, could be classed as one caused by operative interference.

2nd. The marked spontaneous nystagmus to the diseased side which continued until shortly before death, as diagnostic of complicating cerebellar abscess.

Barany says that "A diagnosis of empyema of the labyrinth (total destruction) with cerebellar abscess may at once be made, as a spontaneous nystagmus to the diseased side can only be produced intracranially when the absence of caloric nystagmus has shown the presence of destruction of the labyrinth. Meningitis and cerebellar tumors may easily be ruled out of the diagnosis by the other symptoms."

3rd. The extent of the influence of early subdural drainage on meningitis, as shown at the postmortem.

Case II.—H. E., age 18, white, Hebrew, was admitted to the Eye and Ear Hospital September 26, 1910, complaining of pain in the right ear and mastoid. He gave the following history: Following going in swimming six weeks ago, he had the symptoms of acute purulent otitis media. The ear discharged freely, but in the last few days he had suffered severe pain in the right side of his head.

Examination—Ear: Swelling back of the right ear in the mastoid region and below in the neck. The swelling is hard to touch, no fluctuation and is very sensitive to pressure. There is profuse discharge from the ear.

General examination—Negative as to physical signs. The patient is poorly nourished and has an old apical lesion.

Urine analysis negative.

Blood examination—W. B. C. 15,000. Polys. 87, Lymph. 12, large Mono. and Trans. 1%.

Pus examination—Pus showed diplococci, Gram positive.

Sept. 27, 1910. Mastoidectomy by Dr. Waldie. Necrosis was complete, pus being present in quantities. The tip was removed. During the operation the lateral sinus was accidentally opened. There was a free flow of blood.

October 3, 1910. Temperature shows but little improvement. Swelling in the neck better. Complains of no pain in his head.

October 4, 1910. W. B. C. 11,000. Polys. 85, Lymph. 12, Trans. and Large Mono. 8. Temperature 105.

October 5, 1910. Operation by Dr. Day. Lateral sinus opened, a septic clot removed. It extended from about two inches beyond the knee of the sinus to the jugular bulb, including the latter. The jugular bulb was opened and curetted. No return flow was obtained from the bulbar end. Jugular vein was ligated and resected.

October 8, 1910. W. B. C. 11,400. Polys. 81.

October 13, 1910. No change. Photophobia.

October 14, 1910. Patient delirious all day. Marked myotonia. Knee jerk not increased, no clonus, no Babinsky, possible Koernig's.

Spinal puncture with withdrawal of 20 cc. of quite turbid fluid which examination showed to contain numerous pus cells. Eye grounds negative. W. B. C. 15,000. Polys. 77.

The diagnosis of meningitis was made but no operation was performed at this time because it was impossible to get the consent of the boy's parents.

October 15, 1910. General condition improved. Delirium has given place to rationality. Koernig's negative. Spinal puncture with removal of 20 cc. comparatively clear fluid, which was found to contain pus cells and streptococci.

October 16, 1910. Again delirious. Pulse dicrotic. Lumbar puncture—30 cc. of turbid fluid removed. Temperature 105.

October 17, 1910. Koernig's positive. Numerous rales (toxic bronchitis).

October 19, 1910. Subdural drainage by Dr. Day. Drainage inserted both above and below the tentorium.

October 21, 1910. No improvement. Died 6:30 a. m.

Report of partial autopsy on young Hebrew at Eye and Ear Hospital. Postmortem by Dr Willetts:

External examination of head showed operation wound behind right ear with drainage in lower end of wound.

Examination of brain—Opening through skull into crainal cavity on right side behind petrous portion of temporal bone, above and below the tentorium. The surface of brain immediately in contact with the drain and for a considerable area about it is perfectly clean and smooth with no visible exudate. The lateral sinus was empty and smears made from this and also from jugular bulb and sigmoid sinus showed no pus or bacteria.

Over the entire surface of the brain except this area mentioned above, there was a fibrinopurulent exduate within the leptomeninges This exudate extended into the meninges of the cord as far as could be seen through the foramen magnum. Smears made from the meningeal exudate showed typical streptococci.

Pathologic diagnosis—Diffuse fibrinopurulent leptomeningitis involving all parts of the meninges except an area on right side over right cerebelar and temporal lobes, where drain was applied.

Brain edematous. General purulent leptomeningitis with some fibrinous exudate over both hemispheres, except in the region of the drainage. The temporosphenoidal lobe of the cerebrum and cerebellum were comparatively clear.

While the dural drainage was undertaken too late in this case to hope for recovery, the postmortem findings, taken with the preceding case, show what can be expected from it:

1st. Dural drainage is effective over a limited area, but extends some distance beyond the drain.

2nd. That these dural areas were found at the postmortem comparatively normal. This is probably from the fact that the dural drain is most active at first and ceases after 36 to 48 hours, probably caused by the blocking of the arachnoid spaces leading to the drained area, which also protects it from reinvasion.

3rd. That to be effective in general meningitis, many drains on both sides of the skull would be necessary. Without having had an opportunity to test it, lavage of the cerebrospinal subarachnoid spaces, as proposed by Barr, appeals more strongly to the writer.

XXIV.

SOME RAMBLING THOUGHTS CONCERNING THE RADICAL MASTOID OPERATION.

By Frank Allport, M. D.,

Chicago.

I wish it to be distinctly understood that this paper, or whatever you may choose to call it, is in no sense to be considered in the light of a scientific dissertation. It is merely a gossipy talk on certain aspects of mastoid work, which have been gathered and stored away in my mind since my last published utterance on mastoid surgery some years ago. I am adhering to my old methods in some instances, and in others have abandoned them and am working along different lines. It will be my purpose in this rambling talk to discuss these various aspects of my work and to try to explain why I adhere to the old methods, or why I have come to substitute new ones.

Let us first consider

THE INCISION.

I still make a long curving incision, beginning at the extreme limit of the mastoid tip, and curving around and close to the base of the auricle, and over the auricle to a point directly above the external auditory meatus. (It should be of course understood, that I am talking now about the radical operation). The incision should not be so close to the auricle, as to cut open its lumen, and ample tissue should be left for the insertion of sutures. This incision long as it is will sometimes have to be enlarged downward if much work in and around the tip cells has to be done, and upwards and forwards if much zygomatic disease becomes disclosed. I think it is foolish to try to complete the entire depth of the incision in one sweep of the knife. It is not easily accomplished, and such efforts will usually be accompanied by the production of a ragged and torn periosteum. I think it is better to carefully outline the incision by a comparatively gentle sweep of the knife, as its exact and proper location can in this way be better designated than by an effort at a single primary incision. This incision should be quickly followed by a second, which will lead us to the periosteum, which should then be carefully incised through to the bone, with as little laceration as possible. Unless the hemorrhage is violent I do not bother with artery clamps, for by working quickly, I soon have my self-retaining retractors in position, and then all flap hemorrhage ceases. After the incision is completed, the soft tissues, including the periosteum, is quickly shoved back by a periosteotome, and the adherent tissues at the mastoid tip are cut away by curved, blunt, strong scissors. The retractors are now placed in position, one pair in the upper end of the wound, and another pair in the lower end of the wound, and screwed up to their utmost capacity for expansion.

THE SELFRETAINING RETRACTORS.

The teeth of the two pairs of retractors should not touch nor interlock, as this limits the usefulness of both. The wound should be long enough to freely accommodate both pairs of retractors. This is one reason why I curve my incision around the upper portion of the auricle, and I have never found that cutting a little into the muscle at this point did any harm, or produced any drooping of the auricle. As I have said, the retractors should be screwed up to their fullest capacity of expansion. This is necessary for several reasons. In the first place it is only by such extreme pressure on the tissues that hemorrhage ceases. Partial expansion, I verily believe, produces hemorrhage, and I would rather not use the retractors at all, than to use them partially expanded. It is for the purpose of adding strength and forcefulness to these retractors that I have had the latest models made heavy and strong. The screw head in the old models used to be round, but I found that it was quite impossible to produce much power in a round screw head, especially when the hands are moist, as they always are doing an operation. I therefore had the screw head made flat, so that the arms can be easily spread apart to their utmost capacity, if the wound is at all long enough. The teeth of the retractors should be placed under all the soft tissues, and firmly held there until the arms are fully expanded. With a good long incision, with the two pairs of retractors properly placed, and with the blades fully expanded, there seems little left to be desired in the way of a bloodless and ample field of operation.

I do not make the backward incision, as practiced by Whiting and others, because by the procedures just described I do not need it, and consider it to be a needless incision, the field is ample without it. Of course, if I intended entering the cerebellum, or the backward course of the lateral sinus, I would doubtless make this incision, but not otherwise, except in extreme cases of backward necrosis. It sometimes happens that the tissues are so stiff and swollen that the retractors cannot at first be expanded to their fullest capacity. In this event, we must do the best we can at first, but little by little the retractors will become loosened in their position, and must from time to time be tightened by twisting the screw head, it being remembered that the retractors, in order to fulfill their real usefulness, must always be kept tightly and firmly in position. Otherwise, they simply "wabble" around in the incision (if I may use the expression), perhaps drop out, and instead of being of use, are really a nuisance. I cannot understand why everybody does not use these retractors. I do not say so because I devised them, but, properly used they are so manifestly helpful, that I cannot see why operators persist in ignoring them and in adhering to the old hand retractors. Hand retractors require another person, and another pair of hands around the patient's head. They cannot compare with the selfretaining retractors in the firmness and constancy of their expansion; they do not control soft tissue hemorrhage; they do not provide a constant and complete view of the operative field; they are hard on the assistant who holds them. This very day, as I am writing this communication, I saw an experienced and skillful nurse faint completely away, from the sheer fatigue of the long holding of hand retractors. And let me urge, that if you are going to use selfretaining retractors, that you use only modern models, and that you use them properly. I have been asked if my retractors do not injure the meatus. I can only reply that I have never seen such an occurrence. In the radical operation it does not make any difference anyway, because the meatus is subsequently cut in making the flaps, and in the acute operation, if the meatus is squeezed together pretty tightly, the trouble can be easily remedied by packing the meatus with gauze after the operation is finished, to thoroughly keep its walls apart, a precaution which I notice most operators take anyway, whether they use hand or selfretaining retractors.

After the retractors are in position, the posterior, superior and inferior walls of the cartilaginous meatus should be liberated from the underlying osseous meatus, by passing a small spatula, or something of this nature, between the two structures. If it looks as if the cartilaginous meatus was going to constantly project into the field of operation and annoy the operator, a strip of gauze should be passed through the cartilaginous meatus inwards and brought backwards and the two ends brought tightly together by an artery forceps. This forces down the posterior wall of the meatus, and keeps it out of the way. If this is going to be done the retractors will have to be temporarily removed, the gauze inserted, and the retractors replaced. The retractors will hold the gauze firmly in position after they are replaced. Some operators always insert this strip of gauze and I am not at all sure but this is a good plan. I am more and more inclined to think it is. If this plan is to be followed, the gauze should, of course, be inserted before the retractors are inserted at all, and the cartilaginous and osseous meati should also be separated before the gauze or the retractors are placed in position.

THE CHISELING.

The primary danger in removing the mastoid cortex is, first, the exposure of the sigmoid sinus, especially if it is abnormally placed, and, second, the exposure of the dura of the temporosphenoidal lobe of the brain. The mere exposure of these membranes really does no harm, but it should not be forgotten in opening and working upon the mastoid bone, and should be avoided if possible.

The exposure of the dura as an initial event in chiseling can only be accomplished by chipping out a piece of bone much higher than we have any business to be working. Except in rare instances the middle lobe of the brain does not lie below a line drawn on a level with the roof of the bony meatus. We should never, therefore, begin chiseling above this line. After we have gotten into the bone, and are familiar with its interior landmarks, we will often be able to extend our bone work above this line, especially where the zygomatic cells are affected, but we should never begin chiseling at a point above this line. By observing this rule we will never expose the dura as a primary accident, although this membrane is often uncovered either intentionally or accidentally later on in the deeper bone work.

The sigmoid bend of the lateral sinus is not infrequently situated too far forward, or too close to the cortex, especially in young subjects. In removing the cortex, therefore, we should be careful that the chisel does not sink into the bone very deeply, until we are sure as to the location of the sinus.

From time to time temporal bones with peculiar shaped meati will be seen, that are liable to produce incorrect ideas as to their interior anatomy in the mind of the surgeon. The bones I have in mind have peculiar receding or shelving shaped meatal orifices. The posterior margin of the bony meatus does not come up sharply and somewhat perpendicularly to its position, as it should, but recedes backwards and somewhat upwards, giving the impression of a meatal margin much farther backwards and upwards than is harmonious with the interior anatomy of the bone. If we take the actual external meatal margin as a guide for operating, therefore, in such cases, we would operate much higher up and much farther back than we should, and would therefore be quite likely to open the brain and sigmoid sinus. In such cases we should carefully examine the outlines of the inner meatal walls, and from such calculations begin chiseling where the meatal orifice should be. Such calculations would find us chiseling anteriorly to the actual meatal orifice, in its beveled or shelving surface. I have never seen this point described, and have had some difficulty in expressing myself, but hope I have made my meaning clear. I have verified these warnings in quite a number of instances, and have never found them to fail.

I use a large, broad chisel in beginning my work, and in fact I may say that I always use as large a chisel as possible. Of course, as we proceed inwards, the width of the chisel must diminish, but I am confident that a broad chisel is much safer than a narrow one. I rarely use a square end chisel, as I believe that a rounded one is much safer. I use a large metal mallet, with a wooden interior. I am still looking for an ideal head light, one that is simple, does not get out of order, and one that does not become hot.

There are many ways of beginning chiseling procedures on the mastoid cortex, all of them used by thoroughly good surgeons, and all of them evidently performing satisfactory service to those who employ them. Most operators begin in the upper portion of the bone and work down, but others begin down and work up, while still others begin at the posterior surface of the mastoid process, and work towards the meatus. I know one distinguished otologist who makes a dainty little abrasion in the mastoid cortex, with a chisel and hammer, for the purpose of giving his rongeur a start, an d then laboriously completes his operation with rongeurs and curettes. He is afraid to use a chisel and hammer, for fear that the blows will produce a meningitis or rupture a possible encapsulated abscess. Personally, I have no belief in this view, as I have never encountered such a condition, and it would seem as if he was putting himself to lifelong inconvenience and labor to avoid something which he will probably never meet.

I do not believe it necessary to bother with mapping out McEwen's triangle, or any other landmark; simply do not begin chiseling above the meatal roof and keep close to the posterior wall, and as a rule trouble will be avoided. Personally I believe it best to observe the rule just mentioned, and to peel away long strips of the cortex with a broad chisel, until the interior of the bone is well exposed, meanwhile never allowing the chisel to sink into the bone too deeply or too far back. After the mastoid cavity is exposed I immediately begin breaking down the posterior bony meatus. This has to be done anyway, and by doing it early in the operation we are enabled to work farther forward, as more room is obtained and there is less liability of injury to the sinus. I remove then the posterior wall of the bony meatus at the same time that I remove the other contiguous bony structure. The posterior portion of the mastoid interior and cortex is beveled away with the broad chisel, the edge of the chisel being directed toward the meatus continually, instead of either down or up, as held by many surgeons. The chisel should not be allowed to sink deeply into the bone, for fear of injury to the sinus.

The bony opening should extend downwards to the tip, which it may be necessary to remove in some cases. The posterior meatal wall should be removed down to its very base, in its one-third outer or external portion, so that practically no ridge of bone can be found between the floor of the meatus and the floor of the tip cells. The facial nerve does not extend into this portion of the posterior meatal wall and it can be therefore smoothed down until it is practically on a level with the surrounding bone tissue. A little further in, however, the meatal wall must be handled with great circumspection, for within its structure runs the much-to-be-feared facial nerve. I believe that the upper portion of the posterior meatal wall, or the "bridge," as it is sometimes called, can be best broken down by very careful chiseling work. I have tried various instruments for this purpose, and have finally come to depend more upon the chisel than upon anything else, but the work must be done under good illumination and with great care. I wish to say that I also think very highly of the small curette for breaking down this upper portion of the "bridge." Before this is done, however, we should make room for it by chiseling away the extreme upper portion of the bony meatus and posterior meatal wall so that the roof of the newly made cavity is on a line with the tegmen tympani and tegmen antri. By thus working in a freely open cavity, with plenty of room and good illumination, there will be but little danger of injuring the facial nerve in removing the "bridge" and throwing the whole thing into one large cavity. We should never forget that the facial nerve runs across the extreme upper posterior portion of the tympanic cavity proper, but does not get into the attic at all. We should, therefore, always work up, up, and by so doing we will go a long way toward avoiding danger. In thus working up we will sometimes expose the dura, but I would rather do this one hundred times than injure the facial nerve once.

After the "bridge" has been removed and we can freely pass a hook from the attic to the antrum without interruption, we can lay aside the chisel and hammer and pick out the malleus and incus with forceps and curette without much difficulty, provided one or both of them have not already been absorbed. The middle ear should be very gently curetted for the removal of granulations which produce constant and annoying hemorrhage, and we are now ready for the interior work on the bone. This is done by most operators by rongeurs and currettes, indeed a great deal of the work already described is accomplished by a majority of operators by rongeurs and currettes, but I find it more rapid and convenient to do it by chisel and mallet. The work upon the interior of the bone I perform with electrically driven burs, of which I have a considerable assortment, some olive shaped, some round, some almost smooth, some large, and some small. Before leaving the subject of chiseling and curretting I wish to say that I believe we are all too careless in looking after the condition of these instruments. In order to do good and rapid work our chisels and curettes should be kept sharp. It is astonishing how much easier and more delicately we can work with instruments having keen cutting edges, and yet I think most of us are very negligent on this point.

THE USE OF THE BUR.

I cannot understand why the bur is not in quite general use, for, after many years of experience with it, I can frankly say that I consider it the best, quickest and safest instrument for cleaning out the interior of the bone. Of course, the operator must have a reliable and powerful motor, a strong and bendable cable (a second cable, with handle and a second foot "cut-off," should always be on hand in case of a breakdown), a satisfactory handle and a proper assortment of burs capable of working in all sorts of cavities. I use a foot "cut-off," so that when I press the knob with my foot the bur revolves, and when I take my foot off, it stops. I always work with an aseptic cloth sleeve drawn over the cable, so that I have no fear in handling it. The handle itself can be sterilized. In the motor which I use, the speed of the revolutions can be controlled by a handle. When using a bur I do not attempt to hold the handle gracefully in one hand; the machine is too powerful for this, the bur would jump from place to place under such circumstances. We must have the bur under complete control in order to make it safe. I therefore hold this handle (down close to the bur) with both hands. My elbows are usually steadied against my body, and hands are steadied against the head of the patient. If these precautions are observed, the bur can be used with perfect safety, and it will not jump. I know of no instrument that can be used so efficiently and safely in delicate places, such as around an exposed dura, sinus, facial nerve, or horizontal semicircular canal; and as for smoothing off overhanging bone, cleaning out mastoid cells, "rimming out" the eustachian tube, beveling down the floor of the meatus, smoothing down the posterior wall of the meatus, cleaning out the aditus, and shaping up the cavity in general, and getting out all necrosed tissue, there is no instrument or group of instruments that can at all equal it. But I always say to a surgeon who intends using this instrument, not to be discouraged if he does not like it at first. He must know how to use it, and in order to do this he should not discard it until he has used it twenty or twenty-five times. After he has done this, he will have become an enthusiastic advocate of the bur for mastoid work.

While using the bur the cavity should be frequently washed out with warm sterile water, driven by a powerful syringe, as great masses of bone dust accumulate, and unless washed away and would obstruct our view and impede progress.

The bur should be frequently cleaned by a nurse, as its teeth become filled with bone dust and do not cut well. The bone should be kept moist, either with blood, water or adrenalin, as otherwise the bone and bur become overheated and superficial bone necrosis may follow. I have had a number of these cases, where the first dressings were absolutely black and very foul smelling, but in these cases I have dressed the patients daily with powerful antiseptic douchings and powders, and in a few days this complication has passed away, and I have never seen any unfortunate consequences follow.

I take down all of the posterior meatal wall that I possibly can without injuring the facial nerve. The outer portion of the wall, perhaps the outer third, can be removed entirely and beveled down so that it is on a level with the contiguous bone. As we progress inwards, however, we must remember that the facial nerve is contained within its structure and too much bone must not be removed.

As we bur into the meatal wall in this vicinity, on its edge, we will occasionally see a little bleeding artery making itself manifest. This is the artery which accompanies the nerve, and when seen should be a signal to us to desist from further work in this vicinity.

The remnant of the meatal wall should be burred down with a fine bur, so that there are no rough places, nor elevations on it, and the floor of the meatus should be leveled down, so that there is no obstruction to good drainage. I think that almost all of these cases should be cleaned out way down to the tip cells, and every suspicious place, whether in the mastoid bone proper or in the zygomatic region, should be investigated by the bur and thoroughly cleaned out. When we are through operating we should have produced a large cavity without any overhanging edges, and with every place in the bone looking smooth and healthy. The two hardest places to heal over, in my experience, have been the extreme innermost portions of the antrum, and the aditus ad antrum, but if these are thoroughly polished with suitable sized burs they will heal as rapidly as any other portion of the cavity.

THE EUSTACHIAN TUBE.

I take great pains to thoroughly clean and curette the eustachian tube, as many cases are apparently uncured, when they are entirely well, save for a more or less constant dripping from the tympanic orifice of the eustachian tube. For this reason I think that all of these cases should have all diseased tissue removed from the throat. I mean particularly such conditions as diseased tonsils, adenoids, and granulations or adhesive bands in the fossæ of Rosenmueller. Apparently uncured cases will sometimes be promptly relieved by a removal of such pathologic conditions. At the time of the mastoid operation, it is not sufficient to merely curette away granular tissue from the eustachian tube. It is necessary not only to do this, but to scrape the superficial bone tissue, so that an adhesive inflammation may be produced, which will actually close the mouth of the tube. This I accomplish by curetting the tube and burring out its orifice by hand and electrically driven burs. I am usually able to pass the curette and hand burs down into the lumen of the tube as far as the isthmus, but the electrically driven bur I only hold at the opening of the tube, in order to thoroughly "rim" out the aperture. I am not unmindful of the fact that the carotid artery lies close to the eustachian tube, and there is danger of injuring it. However, I always force the working end of the bur or curette forward and upward and have never had an accident. A distinguished friend of mine has, I understand, ruptured the artery twice, and has been able to control the hemorrhage by tight packing in the tube, but I doubt if we would all be as lucky as this. Our work then in the eustachian tube, while it should be thorough, should at the same time be cautious, remembering always to work forwards, instead of backwards. Sidney Yankauer of New York City, has lately devised some eustachian tube curettes, for the purpose of curetting the tube, and possibly preventing a mastoid operation. These curettes I have used several times while making a radical mastoid operation, and have found them very efficient in curetting the tube. I would also suggest that these instruments might prove useful in adding the last touch to the after treatment of cases, following the radical operation, where a discharge persists that probably is tubal in character. The work under such circumstances would, of course, be performed through the meatus.

THE FLAP.

I have nothing to say against any good flap, but personally I prefer a modification of the Panse flap. The original Panse flap was made by making a vertical incision in the concha, and a horizontal incision throughout the length of the cartilaginous meatus, thus producing what might be termed a T flap. The upper portion was attached upward and the lower portion downward, the intention being to commence a dermatizing process in both the upper and lower portions of the new bone cavity.

I make my flap as follows: I use a lance shaped knife to penetrate the concha. I penetrate from before backwards, in order to be sure where the penetration occurs, as it is desirable to produce as large a meatus as is possible to be consistent with a lack of deformity. This can be accomplished by setting the conchal incision as far back as possible; hence the care in making the original penetration. After this incision has been made, and before the knife has been withdrawn, I pass alongside of it a blunt-pointed bistoury knife, from behind forwards, and then withdraw the lance-shaped knife. The new knife is blunt pointed, so that it will not prick the surrounding tissue, and is curved backwards, so as to more easily get into the corners of the conchal incision. The conchal incision should not be vertical but curved in outline, so as to more thoroughly conform with the natural shape of a meatus, and should extend as high up and as low down as possible.

After this has been done, I insert my divulsors into the meatus, from without inwards, and stretch the cartilaginous meatus to its fullest capacity. I then insert the dull-pointed bistoury knife into the meatus at its inner extremity, and, using the lower blade of the divulsor as a guide, I cut out the meatus up as far as the conchal incision. I throw the entire meatus into the upper flap, because I find that the upper portion of the opening is the only place I ever have any trouble in dermatizing. You will see that I make an L, rather than a T shaped flap.

I usually take out considerable cartilage, especially if it shows a tendency to protrude, as by so doing the flaps fall into place better, and I think there is less danger of perichondritis, which I have had once and never want again. I attach the upper corner of the meatal flap to the soft tissue, in the temporal region, underneath the skin, by a single catgut suture. There really is no lower flap and consequently no suturing is here required.

The cavity is packed with xeroform gauze, smeared with sterile vaselin, to mitigate the pain of the first dressing. I still use the Michel metal sutures, and after they are all in, I crowd the meatus as full of gauze as possible, in order to assist in expanding the entire opening, and especially the meatal orifice.

I have purposely adhered in what I have said, to an ordinary, uncomplicated, radical mastoid operation. The discussion of complications would far overrun any ordinary space that might be given me.

THE DRESSINGS.

The dressings are removed on the third or fourth day. They should be removed with much irrigation, and absolutely without force, lest the repair process should be interfered with. If force proves to be necessary, the packing should remain and be removed at a subsequent dressing. Every alternate suture should be removed at the first dressing, and the remainder in two or three days' time. Formerly, I was much in favor of the continuation of gauze dressings until the end of the case; but now I am not. I believe that after the outlines of the new cavity have been defined, that packing had better cease, and the cavity had better be practically completely filled from dressing to dressing with powdered boracic acid. This keeps the parts clean and does not interfere with the formation of new tissue. It can be easily washed away without violence. The dressings can be gradually decreased in frequency, as their necessity diminishes.

Granulations but rarely occur. Should they present themselves, however, they can be curetted or cauterized with trichloracetic acid.

My cases are usually healed in from eight to ten weeks. They are only in the hospital for about two weeks, after which they become office patients.

THE HEATH OPERATION.

I have not changed my mind concerning the Heath operation, unless I might say that I think less and less of it as time progresses. I have never had any personal experience with it, but have observed the work of others and have reoperated a number of cases previously operated by some of my fellow surgeons, that were utter failures when operated by the Heath method, and were entirely cured by the regular, radical mastoid operation. Of course, I realize that some of my friends may have reoperated my failures and achieved success, but the Heath operation never has and never can appeal to my sense of proper surgery. He leaves practically untouched the diseased middle ear, and the diseased attic, which in my opinion are usually the foci of all the trouble, especially the attic. His method is really not much more than an elaborated simple mastoid operation, and he hopes with an optimistic (but not surgical) mind, that the large opening and the drainage will cure the disease. I do not believe that this hope is safe, sane or surgical, and I therefore cannot espouse it, and would not advise others to. If the tympanic space, including the attic and the antrum, are diseased and necrotic, I think there is but one method to cure this condition and place the patient out of danger, viz., by means of the radical mastoid operation. All other procedures are temporizing in their nature, and are usually the result of timidity, fear, or improper ultraconservativism.

GRAFTING.

As a rule I do not graft at all, as my cases are healed in from eight to ten weeks. If unhealed areas are present by this time, I cover them by small pieces of thin skin, which usually hastens healing. But I do this very seldom. As is well known, Ballance opens his postauricular opening in seven or eight days after granulations on the bone have had a chance to form and covers the entire area with a single large skin graft, held in place by small pledgets of cotton, after which the wound is reclosed. He claims that this materially shortens the healing process; but the patient has to undergo two operations and take anesthesia twice. This is certainly a serious objection to the plan.

Dench of New York has for some years made primary graftings, that is, grafting made at the time of the original operation. For a long time I was opposed to this process, believing it illogical to suppose that grafts would adhere to freshly chiseled bone. I have, however, lately had the opportunity of seeing Dench do some of this work, and of seeing some of his results, and of talking with those who are in a position to know the results, and I have been convinced that it is a good thing, and should be more extensively used. I know of one of his cases that was dismissed cured in two weeks, and certainly nothing that I, at least, can show can at all equal this. He ties all the bleeding arteries, uses a good deal of adrenalin, and waits until there is little, if any, hemorrhage. He then slips into place a large, thin skin graft, and patiently coaxes it into place. He sucks out blood, air and liquid under the graft by a mouth suction pump with a curved glass pipette attachment. This suction also assists in accurately conforming the graft to the cavity. When it is in place he holds it down by little wads of cotton sprinkled with aristol. They are applied loosely. An account of their number is recorded, so that he will know later if all have been removed. The postauricular wound is then closed, and another graft is applied into the external meatus, to heal these parts quickly. Packing is then loosely applied into the cavity, and the regular bandage applied. The first dressing occurs in about five days, and from then on regular dressings are made until the complete healing occurs. I would suggest that a general and repeated trial of this method be made, for one of the grave objections to the radical mastoid operation is the tedious after treatment.

XXV.

FOUR CASES OF FOREIGN BODY IN THE ESOPHAGUS REMOVED WITH THE AID OF THE ESOPHAGOSCOPE.*

By Sidney Yankauer, M. D.,

New York City.

Case 1.—A child 3 years old was brought to Dr. Mayer's clinic in Mount Sinai Hospital with the statement that a week previously she had swallowed a penny. There was some difficulty in swallowing, but fluids could be taken. The fluoroscope showed the presence of a round foreign body just above the sternal notch. The patient was placed upon the table, and without administering any anesthetic a short Killian tube was passed. As soon as the instrument reached beyond the cricoid the edge of the penny was seen, covered with mucus and particles of food, it was seized with forceps, and as it offered no resistance was withdrawn with the esophagoscope. There were no symptoms of any kind afterwards.

The case illustrates how inoffensive a relatively large foreign body may at times be, and how simple a matter may be its removal.

Case 2.—On September 1st, 1910, a child 14 months old was brought into my office with the history of having swallowed a metallic toy, a figure of a rooster. A shadow of the foreign body had been seen with the fluoroscope at the level of the sternal notch. Under ether anesthesia the esophagoscope was at once introduced and the foreign body found and grasped with the forceps. It was readily removed. There was no abrasion of the esophageal walls, even though the foreign body was made of lead, measuring 6 by 15 by 21 mm., irregular in shape, with pointed ends and projections.

This case illustrates that even a heavy, pointed metallic body, when promptly removed with the esophagoscope, may be entirely free from serious consequences.

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*Read before the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, Mass., February 4th, 1911.

CASE 3.—Toward the end of August, last year, a boy 2½ years old, swallowed a penny. At first he complained only slightly of difficulty in swallowing, but as this difficulty increased he was taken to a laryngologist, who inserted his finger into the esophagus and felt the penny. Not having an esopghagoscope at hand, he inserted a curved forceps alongside his finger and grasped the foreign body. It offered so much resistance that he did not consider it wise to force the extraction, but referred the case to me for esophagoscopy. On the fourth day after the accident, I placed the patient under anesthesia, introduced the esophagoscope, and found the penny at once, just below the cricoid. About one-fourth inch above the penny there was a small abrasion of the posterior esophageal wall, covered with exudate, and apparently superficial. When the penny was seized in the forceps it offered no resistance whatever, and was easily withdrawn. The child had a temperature of 100° F. at the time, but this became normal on the following day, and there has been no difficulty in swallowing or other symptoms since.

It is possible that the resistance to removal offered by the foreign body at the first attempt was due to the fact that the forceps, which was introduced blindly, grasped the mucous membrane, a conclusion which seems warranted by the finding of a small abrasion above the penny, at the time of the esophagoscopy. If so, the case illustrates clearly that a foreign body, otherwise harmless, may become serious when any attempt to remove it is made other than under the direct guidance of the eye.

CASE 4.—In contrast with the above, the last case illustrates the extreme danger to which the swallowing of a foreign body may subject the unfortunate victim.

The patient was a boy 4 years old, who swallowed a piece of brass on December 6th, 1910. The piece of brass had somewhat the shape of a truncated cone, the larger diameter being 17 mm., the smaller 6 mm., the height 8 mm. The edge of the smaller diameter was turned over in the form of an irregular burr, having an exceedingly sharp edge.

The patient was admitted to the St. Joseph Hospital in Paterson, N. J., where a radiogram showed the presence of the round body just above the sternal notch. The child could swallow with difficulty, the temperature was 100°. An esophagoscopic examination was immediately made by Dr. Atkinson, who states that although he was able to pass the cricoid and enter the esophagus, the passage was obstructed by a whitish mass, which was soft to the probe, and which was stretched across the opening of the esophagoscope. The foreign body was not seen. On the next day, December 8th, swallowing better; temperature, 99 to 100. Radiogram shows foreign body in same place; slightly different position.

On December 9th, Dr. Atkinson did a second esophagoscopy with the same rseult. Temperature, 99 to 100. On December 10th I saw the case in consultation with Dr. Atkinson. As soon as the esophagoscope reached the level of the cricoid cartilage, I could see that there was an extensive wound of the posterior esophageal wall, about as large as a quarter. It was covered with a whitish exudate, of which I removed as much as I could. When the tube was advanced beyond this area it entered a narrow channel, which opened and closed with respiration; but as the tube could be advanced beyond the point where the foreign body lay, as determined by measurements taken on the radiogram and on the patient, without bringing it into view, I decided that I had entered a fistulous tract behind the esophagus. There was no bleeding. As the esophagoscope was withdrawn, a careful search was made for the lower edge of the opening into this fistula, by following its anterior wall upwards, but it was not found until the moment when the tube passed out above the cricoid. A further examination of the wound was now made, and it could be determined that a right-angled wound existed, running horizontally across the esophagus from left to right, and extending down the right side for a distance which could not be ascertained. An attempt to get over the upper edge of the flap by drawing the cricoid forward, resulted in causing a spasm of the larynx, so that the patient became deeply cyanotic. The tube was withdrawn, artificial respiration done, and oxygen administered. When normal respiration became established, a second attempt was made, which resulted in the same way. I then tried to depress the flap by inserting a probe through the tube, but for the third time the operation had to be discontinued and the patient resuscitated. I decided to make one more attempt, and passed the tube down along the left side of the pharynx, keeping close to the back of the tongue, so as to get over the flap at its base. This maneuver was successful; the tube entered the esophagus, the foreign body was seen and grasped with the forceps, and as it offered no resistance, it was withdrawn with the tube.

I did not see the patient afterwards. Dr. Atkinson reports to me that the patient rallied from the operation, but could not swallow and had to be fed by rectum. On the second day after the operation the temperature rose to 103 3/5, the pulse became rapid and feeble. This condition continued until the following day, when the patient died.

XXVI.

TWO CASES OF FOREIGN BODY IN THE BRONCHUS; A CASE OF TUMOR IN THE LOWER TRACHEA; REMOVAL BY UPPER BRONCHOSCOPY.*

By Sidney Yankauer, M. D.,

New York City.

Case 1.—On June 10th, 1910, I was requested by Dr. Coffin to see a boy 4 years old, at the Manhattan Eye and Ear Hospital, who gave a history of having swallowed a pin a few days previously. He was coughing and vomiting frequently; his temperature was 101.6, pulse 150, respiration 36. A radiogram showed the pin extending from the second rib to the fourth interspace on the right side, the point being up and directed toward the median line. A bronchoscope had been introduced and the pin was seen in the right bronchus, but it could not be grasped with the forceps. I introduced the Killian tube, and upon advancing it into the right bronchus the shank of the pin could be seen, but neither the head nor the point could be brought into view. All efforts to dislodge the point of the pin were unsuccessful. I then put a Lister hook around the pin, and by rotating it against the end of the tube I succeeded in bending the pin to nearly a right angle. I then grasped it with powerful forceps at the bend, and extracted it through the tube, completely doubled upon itself. The pin was brass, about 1½ inches long, with a glass head ¼ inch long.

Within forty-eight hours after the operation all symptoms had subsided and the patient could be discharged cured.

Case 2.—On December 16th, 1910, I was requested by Dr. Brewer to see a patient in his service at the Roosevelt Hospital, who gave the following history:

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*Read before the Eastern Section of the American Laryngological, Rhinological and Otological Society, Boston, Mass., February 4th, 1911.

B. G., female, 12 years old, states that eight months ago, while eating prunes, one of the prune-stones "went down the wrong way." She immediately had such a severe paroxysm of coughing that she was taken to a hospital, where she continued to cough almost constantly for three days. An X-ray plate showed nothing. The cough subsided and she was discharged. The cough soon returned, however, and she was taken to another hospital, where a second X-ray plate proved negative and a bronchoscopic examination failed to reveal the presence of a foreign body. Following the bronchoscopy the cough diminished, and after a week she was discharged. The cough again returned, however, so that the patient sought relief at the Roosevelt Hospital. An X-ray plate at this hospital showed an indistinct shadow in the region of the left bronchus.

Physical examination showed that the left chest expanded 1¾ inches less than the right; the percussion note over this side of the chest was normal, but there was a complete absence of voice, breathing and fremitus over the lower half. Sibilant and sonorous rales were present on both sides. There was mucous expectoration and slight temperature, never above 100° F.

On December 16th I made a bronchoscopic examination under ether anesthesia. Owing to an unusual rigidity of the muscles of the neck, which could not be made to disappear, even under profound anesthesia, some difficulty was experienced in introducing the tube, so that fully 15 minutes were consumed before the larynx was passed. As soon as the tube entered the trachea an immediate search was made for the bifurcation, which is usually the easiest and most distinct landmark in the bronchial tube. This structure was not found at its usual distance from the teeth, and it was not until the bronchoscope had been advanced considerably further that a division was seen, which was immediately recognized as the bifurcation of the right bronchus, and not the bifurcation of the trachea. The tube was therefore withdrawn the left wall of the bronchus searched for indications of the tracheal division. After passing the usual site of the spur two or three times, a white area could be recognized in the posterior half of the left bronchial wall, which I detemined to be a part of the spur, very much swollen and edematous. The tube was therefore pressed firmly into the left tracheal wall above this area, when a depression could be recognized, which was filled with secretion. This proved to be the swollen orifice of the left bronchus, for when the tube had been advanced about 1½ cm. into the swollen parts, the lumen of the left bronchus suddenly opened out before the end of the instrument, and the foreign body could be clearly seen lying horizontally across the lumen of the bronchus. It was seized with the forceps, and as it was not fixed it was drawn up to the end of the tube. It was too large to pass through the tube, so that the two were withdrawn together.

Convalescence was very rapid; within 48 hours the physical signs and the cough disappeared completely, and the patient has remained entirely well since.

Case 3.—In addition to these cases I wish to report briefly a case of tumor of the lower trachea which I saw recently with Dr. Mayer.

Margaret I. W., 3 years old, had been suffering eight months from a spasmodic cough of gradually increasing severity, and was referred to Dr. Mayer for diagnosis. Examination of the nose, throat and larynx proved negative; there was entire absence of respiratory murmur over the lower half of the left chest, and radioscopic examination showed a shadow over the same area. Dr. Mayer made a diagnosis of obstruction of the left main bronchus of unknown origin, and took the patient to Mount Sinai Hospital for the purpose of making a bronchoscopic examination.

The child was etherized; when the epiglottis was touched with the speculum, the patient became cyanotic, so at Dr. Mayer's request I introduced a Killian bronchoscope with an etherizing attachment, and found, in the lower part of the trachea, just above the opening of the left bronchus, a cauliflower growth, occupying about two-thirds of the lumen of the trachea, attached to the posterior wall by a broad pedicle and covered with white exudate. It was removed piecemeal with a bronchoscopic forceps. There was little bleeding.

Following the operation the child gradually improved, and now all symptoms have disappeared. The exact nature of the tumor could not be determined by microscopic examination. Serum diagnosis for syphilis and tuberculosis were negative. Full details of the case will be published by Dr. Mayer.

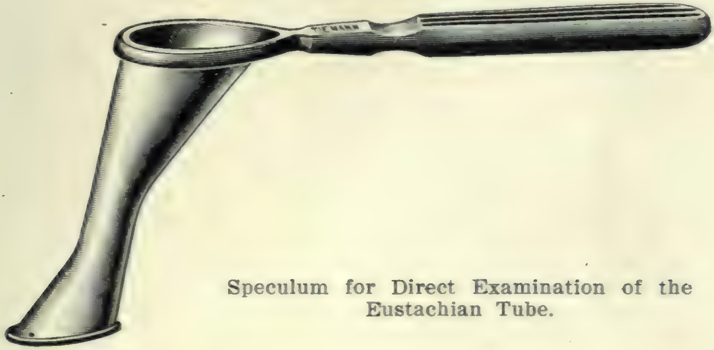
XXVII.

A SPECULUM FOR THE DIRECT EXAMINATION AND TREATMENT OF THE EUSTACHIAN TUBE.

By Sidney Yankauer, M. D.,

New York City.

This speculum consists of a tube of a peculiar shape which is introduced into the nasopharynx, and illuminated by means of the ordinary head-light. It acts as a palate lifter, and as the anterior wall of that part which lifts the palate is on a straight line with the posterior wall of the part which presses the mouth back, it enables us to bring into view the orifice of the eustachian tube and part of its anterior wall.



Speculum for Direct Examination of the Eustachian Tube.

Its introduction is accomplished by placing the beak under the soft palate, while the body of the tube lies across the tongue, and the proximal part of the instrument rests in the angle of the mouth on the opposite side. The patient's head is held backwards as far as possible, and turned to an angle of 45° toward the side which is to be examined. The use of

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*Read before the Section on Otology, New York Academy of Medicine, February 10th, 1911.

cocain is necessary for the first few introductions, but the patients soon learn to tolerate the instrument without gagging.

The first part which comes into view is the vault of the pharynx, then the fossa of Rosenmüller, the posterior lip of the tube, the orifice of the tube, and part of the anterior lip of the tube.

For the exposure of the fossa of Rosenmüller and the posterior lip, cocain may be dispensed with; but to bring the orifice into view the throat must generally be cocainized.

With this speculum it is possible to remove adenoid tissue from the vault or from the fossa with any kind of straight forceps; to cut adhesions which are frequently seen across the fossa; to make applications to the interior of the fossa; to inflate the ear with a straight catheter; to introduce a small tube into the eustachian tube and examine its interior. It is made by Tiemann & Co., of this city.

XXVIII.

MASTOIDITIS WITHOUT APPARENT INVOLVEMENT OF THE MIDDLE EAR.*

By Chas. E. Perkins, M. D.,

New York City.

In cases of mastoiditis we see an almost constantly existing purulent discharge from the ear and changes in the drum membrane, generally associated with narrowing of the canal in its vicinity from swelling of the posterosuperior wall, which here lies over the mastoid antrum. In certain infrequent cases, however, we have these signs absent. I will report briefly four of such coming under my observation.

Case 1.—W. H., male, 51. Came under my care in June, 1908. He complained of fullness in right ear, but entire absence of pain. The drum membrane had its normal luster and color, but seemed to be depressed. Inflation sound appeared to be somewhat moist. On second inflation a few days later this moist element had disappeared, and the ear, so far as one could see, was absolutely normal. One week later he had developed a swelling in the upper wall of the canal at its external extremity. This swelling was not tender on pressure nor did movement of the auricle elicit pain. It continued to grow larger and extended behind the ear, causing it to stand away from the head. Opening of the postauricular swelling evacuated a large quantity of pus, and probe encountered bare bone, thus showing purulent collection to be subperiosteal. So, on July 1st, the patient was admitted to Dr. Dench's service at the New York Eye and Ear Infirmary, and I performed the mastoid operation. The bone was sclerosed throughout, except for one tract of cells extending from the mastoid antrum to the zygoma, which had broken down and formed an external exit for the pus. There was also a perisinus abscess.

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*Read before the Eastern Medical Society, New York City, March 10th, 1911.

The patient recovered from the operation and went to work, the wound being practically healed in four weeks.

Case 2.—S. L., female, age 25, referred by her physician on July 27, 1909, for three months had a small swelling behind the left ear, which appeared just subsequent to confinement. Examination showed a hard, nonfluctuating mass behind and above the ear about an inch in diameter. The auricle seemed to stand away from the head. The external auditory canal, the membrana tympani and fundus appeared absolutely normal. I advised postauricular exploration, and at the Infirmary I operated on the following day and found the mastoid completely broken down, a large perisinus abscess and a large quantity of pus. The tympanic vault was completely walled off by firmly organized tissue, which I did not disturb. Examination of the pus showed infection to be streptococcus capsulatus. The patient made a perfect recovery. At no time was there the slightest discharge from the canal. Wound was completely healed in five weeks.

Case 3.—R., female, age 2½ years, was brought to the New York Eye and Ear Infirmary in November, 1908, with a swelling in front of the ear, which gave doubtful fluctuation. The swelling was diffuse and occupied the region of the temporal muscle, extending well over to the external angular process of frontal bone. The ear did not stand away from the head. Dr. Dench examined the case and pronounced the external canal, fundus and membrana tympani to be absolutely normal, but decided, notwithstanding the aural condition, to explore the swelling, which proved to be a subperiosteal abscess in the temporal fossa arising from mastoiditis, perforating through the zygoma quite anteriorly. The mastoid was cleared out, and the patient made a slow but complete convalescence.

Case 4 was on the service of Dr. Theo. Janeway, in St. Luke's Hospital, at whose request I examined the patient. Wm. E., age 69, admitted July 25, died July 26, 1910. On June 7th patient began to have pain in his right ear, which remained quite constant. There was, however, no discharge at any time. July 22d, stiffness of the neck appeared, headache and fever came on, with loss of appetite and vomiting. He became unconscious and was sent to the hospital, where he lay comatose; stertorous respiration with twitching and convulsive movements over whole body, worse on right side.

Fluid from lumbar puncture gave short chained streptococcus. No choked disk. I examined him on July 26th, about six hours before death. His left ear was normal. On right side the lumen of the canal was narrowed by diffuse swelling at entrance. The fundus was not contracted, and the color and luster of the drum appeared normal. I advised decompression operation, making a mastoid exploration the first step. Subsequently culture of the blood showed presence of pneumococcus. No operative interference was undertaken. Autopsy showed extensive mastoiditis, sinus thrombosis and general purulent meningitis.

The route of infection in these cases may be through the blood or through the middle ear. In the former case we would have primary osteitis of the mastoid process. This must be very rare, and I believe the usual route of the infection is through the middle ear, notwithstanding the fact that it seems to take so small a part in the process. The infectious material merely passing through the middle ear and not finding conditions favorable to its growth, it produces no apparent symptoms or signs there, and not until it reaches the mastoid antrum, and this becomes walled off from the tympanum by closing of the aditus by inflammatory swelling, does the infective material proliferate and cause breaking down of bone tissue with consequent mastoid abscess.

In case 2 this wall of tissue had become firmly organized, completely separating the middle ear from the mastoid.

In making a diagnosis we are confronted at the outset by the absence of those signs upon which we are in the habit of relying. We can form no judgment from the amount and quality of the discharge, the changes in the membrana tympani and surrounding parts, for in these cases these signs are absent. Spontaneous pain is of very slight value, as it may be due to neuralgia of one of the nerves extending behind the ear. Tenderness on pressure, while much more valuable from a diagnostic point of view, may also be due to unimportant nerve conditions. I have seen cases of neuritis and neuralgia in which the distribution of the pain and tenderness on pressure followed the course of the auricularis magnus or the small occipital. These conditions, as also hyperesthesia over the mastoid, which is not infrequent, must be eliminated before we can attribute the tenderness to mastoid involvement. Whenever one operates in a case in which the symptom most relied upon is tenderness on pressure, he runs the risk of being disappointed in his findings. How much more so when it is the only symptom. When, however, swelling and edema over the mastoid are associated with the tenderness, and we can exclude other causes, especially furuncle of the canal, we have a clear case, and the mastoid should be explored. So all abscesses and tumefactions in the region of the ear should be looked upon with suspicion. The ordinary subperiosteal abscess, with its characteristic appearance, the auricle standing away from the head, would be easily diagnosed, but it would be more difficult when the pus had made its way anteriorly beneath the temporal muscle, as in case 3, and presence of fluctuation was doubtful. Or the pus might find its way into the neck, giving rise to swelling and tumefaction below the mastoid process, the so-called Bezold's type, or the pus may appear on the posterior wall of the canal and simulate furuncle very closely. After study of the case an exploration of the mastoid may be the only way to settle the matter. If the cause of the enlargement should be discovered before the bone is opened, so much the better. On several occasions I have found the condition to be a broken down postauricular lymphatic node, and I have thereupon desisted from invading the mastoid. When without external signs or symptoms the disease invades the cranial cavity, we are confronted with a most difficult problem. Meningitis, if established by lumbar puncture to be of purulent form, and especially if the organism found is one of those usually causing middle ear suppuration, viz., streptococcus, streptococcus capsulatus or pneumococcus, should direct our attention to the mastoid, and if no other cause can be found, especially in the nose or accessory sinuses, it should be opened either as part of or previous to a decompression operation. In sinus thrombosis we have characteristic temperature, with absence of malarial parasites, and finally positive blood culture, not only justifying operative interference, but making it imperative.

If we have made a diagnosis of brain abscess, located in the temporosphenoidal lobe or the cerebellum, in determining the method of operative procedure, we should bear in mind the fact that nearly all abscesses in these locations are caused from aural infection, and the mastoid should be opened, not only with the hope of removing the source of infection, but as giving the best possible approach for evacuation and drainage.

In case 4 the presence of narrowing of the external auditory canal near its entrance impressed me with the possibility of this being a symptom of some diagnostic value in some cases. Asymmetry of the two canals with absence of indication of otitis externa would make us suspect the narrower canal, even if the fundus remained of normal caliber.

105 N. Seventy-seventh St.

XXIX.

A CASE OF SPINDLE-CELLED SARCOMA OF THE MASTOID.

By Otto Glogau, M. D., M. U. D. (Vienna),

New York City.

Malignant growths of the mastoid process are very rare and therefore of special interest both from a diagnostic and therapeutic point of view. My reason for presenting the following case is that in reviewing the literature I did not find a similar one reported.

On March 11th, 1910, a man, 45 years of age, was brought into my office in a half-fainting condition.

Previous History.—From his relatives I learned that about the end of November, 1909, he felt pains in his left ear and "his drum was opened." As the pain continued "the bone was opened" two weeks later in the hospital. As no relief was thereby obtained, and the pain now extended over the whole head, "the bone was cleaned out thoroughly" about the end of January, 1910.

Status Present.—Patient is semiconscious, very weak, complaining of severe pains extending all over the head. Respiration 24, pulse 118, temperature 102.8 F.

After removing the dressing covering his left ear, the mastoid and surrounding places presented the picture of a cauliflowerlike mass of exuberant granulations, covered by a yellowish foul discharge. The granulations consisted of lobules from the size of a pea to that of a hazelnut and extended upwards to the level of the superior margin of the auricle, downwards all over the neck to the shoulder, anteriorly to the middle line of the neck and posteriorly, beginning from the mastoid to the middle of the occiput. There was an open wound behind the ear, evidently resulting from a radical mastoid operation. Another wound, beginning in the middle of the above-mentioned and running directly backwards, was probably due to an exploratory opening of the cranial fossæ. Alongside of the said incisions and in various other parts of the diseased area there were many fistulous openings, through which the probe passed either deeply into the middle ear, or under the subcutaneous tissue, thus showing that the whole area was undermined. There exuded a foul discharge from these sinuses. The external ear was filled by the same kind of granulation tissue, so that it was impossible to introduce a speculum.

The pronounced rotatory nystagmus to the right and the apparent deafness of the left ear indicated to examine the patient for labyrinthine suppuration. However, his condition did not permit of any such tests. It being only six weeks since the radical mastoid operation, the writer could not account for such an amount of excessive granulation tissue and was inclined to believe the condition to be due to a malignant degeneration of the granulating wound. The relatives denied the presence of enlarged glands or of any other swelling around the mastoid previous to the operation.

The mental condition of the patient, together with his pulse and temperature, pointed to an involvement of the meninges. The constant oozing of pus through the mastoid wound made it necessary to locate and eradicate the suppurating focus. Therefore the question as to the malignity or benignity of the granulations had to be settled immediately. I removed a piece of the granulation tissue and sent it into the laboratory for microscopic examination, as it was my firm belief that we had to deal with a malign growth. Another otologist, who had been called in consultation, laid much stress upon the history given by the relatives and pronounced the granulations to be benign; he agreed, however, to postpone any operative interference until the laboratory report was at hand.

I had the patient removed at once into the hospital. His temperature was then 102 F., pulse 118, respiration 24. He complained bitterly of severe pains all over his head, especially pointing to the affected side, was very restless and slightly delirious. At night he got 1/6 of a grain of morphin hypodermically. His temperature rose steadily till it reached, after two days, 104 F. The discharge from the mastoid wound and the fistulous openings became more copious and malodorous. Awaiting the report from the laboratory, the local treatment consisted of Liquor Burrowi applications and injection of living lactic acid bacilli suspension into the discharging sinuses. On the second day of the patient's stay in the hospital I had the great pleasure of demonstrating the case to my friend and teacher, Dozent Dr. Heinrich Neumann, from Vienna, who just happened to be in New York. Dr. Neumann refused to look at the mastoid wound, saying that the clinical symptoms the patient showed were typically those of meningitis of otitic origin and called for an exploratory operation. He immediately changed his opinion as to operation when I removed the dressing from the mastoid wound and showed him the mass of ulcerating granulations. In his opinion it was a malign growth, probably a sarcoma, and no treatment whatsoever of any avail.

The next day I got the answer from the laboratory. Dr. Goldfrank reported the specimen to be a spindle-celled sarcoma. A blood count was taken and there were found 41,000 leucocytes, polynuclear 89%, lymphocytes 11%. Within the next few days the sarcomatous masses spread, involving the adjoining skin of the neck, shoulder and occiput and encroaching more and more on the meninges, as evidenced by the mental and general condition of the patient. With slight remittances, the temperature kept on being very high.

Although convinced that there was nothing to be done for the patient, it occurred to me to try Dr. Coley's fluid (mixture of streptococcus and bacillus prodigiosus), which was supposed to be of value in the treatment of sarcoma. When I described the case to Dr. Coley over the telephone, he told me that he had seen and diagnosed the case in his hospital and dismissed him as not being suitable for treatment with his fluid; but, still, upon my request, he promised to send me some. When I told the relatives of the patient what I learned from Dr. Coley and asked them why they did not tell me the truth and save me and the patient all the unnecessary trouble to obtain a diagnosis which was already made, they gave me the very characteristic answer: We wanted you to find out for yourself what is the matter with the patient and how his life can be saved. On further inquiry I then learned that the patient had a little swelling back of the ear since quite some time, which started to pain at the end of November, 1909. As the pains were believed to start from the middle ear, he first had his drum opened and later the mastoid.

On March 28th I injected one minim of Coley's fluid into the patient's buttocks. During that day he got ten severe chills. His pulse grew at times nearly imperceptible and became better only after repeated camphor-ether injections. Slight twitching of the facial muscles could be noticed. He complained of excruciating headaches. On the next morning one-half minim of Coley's fluid was injected into the tumor itself. In the afternoon the pulse was imperceptible and could not be improved by camphor injections. Twitching of the eyelids and facial muscles set in, and the patient died a few minutes later in convulsions. Postmortem refused by the relatives.

Epicrisis.—The pains caused by a sarcomatous retroauricular gland were believed to be brought about by suppuration of the middle ear with subsequent mastoiditis and could not be relieved by paracentesis nor by a simple and a radical mastoid operation. Through the operative trauma the latent sarcomatosis of the gland became manifest in causing the postmastoid granulation tissue to degenerate malignly and grow excessively. The process encroached upon the middle ear and destroyed its inner and upper bony walls, thus producing labyrinthine symptoms and meningitis.

It is impossible to decide, if by not operating on the mastoid, the process might have been delayed for a few years; but by removing a piece of the gland and examining it microscopically, the diagnosis might have been established at a time when Coley's fluid could have been given a fair trial.

1184 Lexington Avenue.

XXX.

MASTOIDITIS FOLLOWED BY CEREBRAL SYMPTOMS; RELIEVED BY DECOMPRESSION OPERATION.*

By Charles E. Perkins, M. D.,

New York City.

I. A. F., male, age seven and a half years, came to my clinic at Bellevue and University Medical College on November 29, 1910, with history of having had a mastoid operation one year previously, with wound healing but persistence of aural discharge.

Two weeks before coming under my care a swelling had developed behind the ear and the lower angle of the old wound broke down. On examination, he was found to have a slight swelling over the mastoid with a sinus at the lower part, leading in a direction upward and forward, which discharged a small amount of pus. The ear was also discharging freely.

On the following day, November 30, 1910, at the New York Eye and Ear Infirmary, he was admitted to the service of Dr. Dench and the mastoid was opened. The inner table in the middle fossa appeared normal. The dura was not exposed except for a small area, where it was normal. Patient reacted well from the operation and appeared to be doing well until the second day, December 2, 1910, when at 8:30 a. m. he was taken with a convulsive seizure and became unconscious, and remained so. The movements were practically limited to left side of face and body, and were jerky in character. The eyegrounds showed enlarged veins and swelling of the discs. Uranalysis negative.

A small amount of bloody serum obtained by lumbar puncture under normal pressure gave a negative examination, except three colonies of staphylococci—probably a contamination.

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*Read before the Section on Otology, New York Academy of Medicine, February 10th, 1911.

Blood count, 5,200,000 red; 19,400 white; polymorphonuclears, 89%. Temperature 102. As the patient had become very weak and was rapidly sinking, and evidently passing into a moribund condition, and as the convulsive movements were practically limited to the side opposite the mastoid, an exploration of the brain and decompression operation were decided upon. Thereupon, at 12:30 on Dec. 2, 1910, I proceeded to operate.

The former wound was opened and incision extended forward to about one inch posterior to the external angular process of the frontal bone, and at right angles to this and about three-quarters of an inch from anterior end another incision about one and one-half inches long, thus exposing a large area on the side of the head. The inferior surface of the temporo-sphenoidal lobe was approached by removing the inner table to very near the superior semicircular canal, the superior wall of the external auditory canal and bridge being taken down to do so. Then a large surface of the dura on external aspect of the brain was exposed, working well forwards toward motor area. The dura was then incised by crucial incision, the lower arm of which extended well on to inferior surface to near the superior semicircular canal. The brain appeared normal. Exploration with slender knife to depth of one to one and a half inches in various directions gave negative result. From inferior surface, incision of knife upward and forward for about two inches brought a free hemorrhage, easily controlled by packing the wound. Partial suture and dressing applied.

When the patient emerged from the ether he was free from convulsive movements. The dressings were soaked with serous fluid for about two weeks. Formation of moderate sized brain hernia, which, however, dermatized without difficulty, healing completely in eight weeks.

XXXI.

REPORT OF TWO CASES OF CEREBELLAR ABSCESS WITH THROMBOSIS OF THE LATERAL SINUS; OPERATION; RECOVERY.*

By D. S. Dougherty, M. D.,

New York City.

Cases of intracranial complication of middle ear disease, while not infrequent, are always interesting and instructive, and for that reason, if for no other, the following cases are worthy of reporting:

Case I.—Chronic suppurative otitis media, followed by perisinus abscess, gangrenous thrombus of lateral sinus, and cerebellar abscess.

On Friday, November 8, 1908, I was requested by Dr. L. A. Roos to see Miss S. R., aged 19, who had been under his care, with the following history: Had suffered from suppurative otitis of the left ear for past ten or fifteen years, with almost total deafness on that side for past two years. Had had no serious illness; suffered from astigmatism, and wore glasses for the correction of the same; had occasional severe headaches for two or three weeks, and at times complained of photophobia; had loss of appetite, feeling of tiredness, and occasional spells of vertigo. On the previous Tuesday had paroxysms of earache, and the discharge, which had been profuse, became scanty. On Wednesday was seen by her physician, who prescribed bichlorid douches and the application of an ice bag, and administered calomel. The discharge again became profuse, with pronouncedly fetid odor. Patient fell on attempting to rise from bed. Temperature 99.8°; pulse 96, respirations 22. On Friday had fallen unconscious in bath room.

At ten o'clock of the same day I first saw the patient. She

***Read before Section on Otology, New York Academy of Medicine, February 10th, 1911.**

then complained of pain in the left ear and intense vertigo, but was indefinite in regard to the direction of the vertigo. Had had a chill lasting for four minutes earlier in the day, and had just recovered from one lasting half an hour. Was nauseated. Temperature 104; pulse about 140, small and irregular; respirations 24. A thick, foul-smelling discharge was pumping out of the external canal so profusely as to give positive evidence of the involvement of a greater area than the middle ear. There was extreme tenderness over tip and antrum, but no external signs of jugular involvement. Pupils were normal in reaction; slight nystagmus present.

Immediate operation being advised, the family asked for further consultation, and Dr. W. C. Phillips was called and concurred in this opinion. Examination of the pus showed it to be streptococcic. Blood examination showed slight increase in leucocytes but high polynuclear ratio.

The patient having been transferred to the hospital, was operated on at five p. m. She was in bad condition, pulse irregular,—rate from 140 to 160; respirations rapid and shallow. With the assistance of Drs. Mann and Roos, Dr. Gwathmey anesthetizing, and Dr. Phillips being present, the usual mastoid operation was performed. On removal of the cortex an offensive, dark, slimy fluid was disclosed, and the cellular structure of the bone found to be almost entirely destroyed. The antrum was filled with pus, while the dark discharge was traced to a perforation in the bony casement of the lateral sinus, which was necrosed and easily removed with the curette. The walls of the sinus were gangrenous, and a large ragged perforation immediately over the knee exposed a dark greenish-colored clot. This was removed, together with a thrombus of the emissary vein, and the sinus thoroughly exposed and curetted, both backward to the torcula and downward to the bulb, getting a good return circulation in both directions. The patient being in a state of collapse, it was deemed wise not to pursue the operation further. The diseased portions of the wall were removed, and the sinus closed by pressure with the usual iodoform gauze tampons under the bone edges. The wound was then thoroughly closed and dressed. 600 cc. of normal salt solution was infused. Temperature fell to 100.2, pulse to 88.

November 9th to 14th. The patient rested comfortably except for occasional slight headaches; the temperature ranging between 99.2 and 99.8; pulse 68 to 72 and regular. Differential blood count showed but slight infection.

November 15th. The patient became very restless and complained of chilly feeling and headache. Temperature 101.8, pulse 76 and irregular. Had pain in neck and tenderness on pressure over jugular. No nystagmus, no neuroretinitis. Polynuclear ratio rose from 62 to 80 per cent.

Deciding to resect the internal jugular, Dr. T. P. Berens was called in consultation, and confirmed this opinion. On exposure of the jugular, its coats were found diseased, and it was resected to the clavicle. The mastoid wound was cleansed, and radical mastoid completed.

November 16th to 19th. The temperature remained between 100 and 101°; pulse 104 to 120; patient complained only of pain in back.

November 20th. Became restless and at times irrational. Severe pain at back of head and eyes.

November 21st. Temperature 99.4°; pulse 80. Became extremely restless, very drowsy, screaming on awakening, and immediately falling into stupor. Continually picked at face and body. Differential count showed leucocytes and polynuclear ratio both increased. At a consultation held by Drs. Berens, Dench, Roos, and Dougherty, an exploratory operation for the presence of cerebral abscess was decided upon. At 7 p. m. the patient was anesthetized by Dr. Gwathmey, and with the assistance of Dr. Roos and Dr. Berens, Dr. Dench being present, the tegmen tympani was removed, and the sphenotemporal lobe explored with negative results. Careful palpation of the exposed dural surface disclosed considerable tension, with a patulous point immediately below the knee of the sinus. Incision at this point evacuated about a dram of pus. Exploration with a grooved director showed the abscess cavity to extend backward and downward about an inch and a half. A cigarette drain was inserted and the advisability of counter drainage considered. This being of easy and rapid performance at any time, it was thought better to defer it. At Dr. Berens' suggestion, a flap was made from the external canal, and packed firmly against the exposed sphenotemporal lobe.

November 22nd to 27th. The temperature ranged from 99 to 100°; pulse 84 to 96. The patient was at times irritable and restless, occasionally picking at clothes and talking irrationally. General condition fairly good, blood count indicating slight infection. Wound was dressed and a new drain inserted daily.

November 28th. Temperature rose to 103°, and pulse 160, irregular in character. Speech became indistinct and incoherent, and patient suddenly collapsed, being cyanosed and pulseless. Normal saline solution was infused, and without removing her from her room a portion of the occipital bone was removed and an incision made in the lower part of the abscess cavity, through and through drainage being established by means of the insertion of a second cigarette drain to meet the distal end of the first. The temperature dropped to 100.8°, and pulse to 96, the latter being more regular and of better quality.

November 29th to December 9th. Pulse ranged from 96 to 108, fairly full and regular; temperature 99 to 100°. The drains were removed and reinserted every day, occasionally being shortened.

December 10th. The lower drain was removed, the central and lower portions of the cavity being practically closed.

December 14th. The upper drain was left out.

The patient since the counter drainage, was at times restless and irrational, but the sensorium was generally normal. Headache was occasionally present.

December 14th to 29th. The patient maintained a fair average condition, and was able to sit up in bed for short periods.

A large cerebral hernia which had developed through the upper incision and a smaller one at the lower, were treated during this time by compression, but without very material result.

December 29th. The patient was anesthetized and an attempt made to as far as possible close the wound and give support to the larger hernia. The external canal was denuded of epithelium, with the idea of forming a solid anterior supporting wall by forcing the complete closure of the canal. The auricle was dissected up and drawn backward, and the edges of the wound approximated as nearly as possible, being retained by strong sutures.

December 31st. During the night the patient became very restless and nauseated, occasionally picking at the bedclothes; pulse weak and intermittent, evidently suffering from cerebral compression. The pressure was relieved by cutting the retention stitches, with a complete subsidence of the symptoms.

January 2nd. Complained of slight pain in right ear, the temperature rising to 101°. Examination showed drum membrane inflamed and bulging, and myringotomy was promptly resorted to.

January 2nd to February 10th. Wound was treated as an ordinary open wound, slight pressure being maintained on the hernias, the smaller one having almost entirely disappeared. The exposed surface being so large, the question of covering it was considered, and Dr. J. A. Bodine was called upon for an opinion as to the advisability of a Koenig operation, but advised against it and suggested a flap from the scalp and periosteum above the wound. Accordingly, under general anesthesia, a triangular flap, including the periosteum, slightly larger than the exposed surface, was taken from the scalp, leaving the apex attached posteriorly. This was brought down and anchored by retaining sutures, attached to the posterior aspect of the auricle and the neck. A considerable portion of the remainder of the scalp was then dissected up and stretched down as far as possible over the newly made raw surface. The flap adhered readily and healed firmly, except over the antroinferior corner, where a small skin graft was laid. The patient was discharged from treatment March 10th.

Contrary to expectation, fibrous contraction and formation of cicatricial tissue failed to make a stout support, and to-day the covering of the exposed brain is rather thin. The patient, however, experiences no inconvenience, except perhaps in the appearance of the deformity.

Case II.—Chronic suppurative otitis media; thrombosis of lateral sinus; cerebellar abscess.

The patient, J. D., laborer, aged 50, was transferred to my service from the medical service July 27th, suffering from chronic otitis media; had been under treatment for chronic bronchitis.

Previous history. Had suffered for years from shortness of breath and palpitation of the heart. Had chronic cough.

Did not remember when ear began to run; had always been troubled by it at times. For past two weeks had had throbbing pain in right ear with profuse discharge, and for past week had had difficulty in closing right eye. Examination showed the external canal blocked by a mass of polyps, tenderness over tip and antrum, and slight facial paralysis. Examination of pus showed mixed infection, streptococcus and staphylococcus. He refused operation.

August 5th. At noon patient had severe chill, his temperature rising from 99.6 to 103.4°; had vertigo and nausea; pupils normal in reaction; no nystagmus, no optic neuritis. Leucocyte count 15,000; polynuclear 82%.

August 6th a radical mastoid operation was done; the bone was soft and infiltrated with pus; antrum filled with pus, and middle ear with granulation tissue and polyps; facial nerve exposed. The sinus was partly exposed by carefully curetting away the necrotic bony covering. The walls were angry grayish red in color; no pulsation present. The sinus was then laid bare from just above the bulb to midway between the knee and torcula, showing a healthy color except at first point. Compression being made over these ends by means of pledgets of gauze inserted under the bony edges, the sinus was opened, revealing the presence of an organized clot, which was removed. Curetting backward and downward, no further obstruction was encountered, and free circulation was established in both directions. The exposed ends were then closed by compression with tampons of iodoform gauze and the wound dressed.

August 6th to September 1st. Patient's general condition good, temperature ranging from normal to 99.8°; pulse full and regular, rate about 84.

September 1st to 7th. Patient not so well; drowsy and disinclined to sit up; irritable when aroused.

September 7th. Had chill and nausea in the evening; temperature rose suddenly to 103.6°; pulse 120—small, irregular. Somewhat irrational, and very drowsy. When raised in bed, complained of vertigo toward the left side. Nystagmus toward the affected side and neuroretinitis present. Leucocytes 32,000; polynuclears 87 per cent. Spinal fluid normal. Ordered immediate operation. The tegmen was removed and the sphenotemporal lobe was explored with a long, thin, straight bistoury, but with negative results. Inspection of the dura under knee of sinus revealed a small point apparently ready to rupture. Incision over this resulted in the evacuation of considerable pus. Probing with a director, the direction of the abscess cavity was found to be inward and backward. A large cigarette drain was inserted, and the wound dressed. The temperature dropped to 101° ; pulse to 96.

September 8th to October 1st. Recovery uneventful. Drain removed every day for a week, and then every other day, using shorter drains frequently, until eventually, October 1st, it became impossible to reinsert it. During this time the temperature kept at about 100° ; pulse rate 76 to 80.

A small hernia of cerebral tissue appeared around the drain at about the seventh day, and was removed with sharp scissors. Slight pressure was thereafter made around the drain with a wick of gauze. The wound granulated healthily, and was covered with a small flap from the scalp, aided by a few skin grafts. The patient left the hospital December 29th, and we have not been able to get in touch with him since.

An interesting point in both of these cases is the probability of direct infection into the cerebellum through contiguity of tissues.

XXXII.

ON THE POSSIBLE EFFECT UPON THE AUDITORY LABYRINTH OF THE EHRLICH-HATA REMEDY IN THE TREATMENT OF SYPHILIS.*

By Prof. G. Alexander, M. D.,

Vienna, Austria.

(Translated with the Author's Permission by George L. Richards, M. D., Fall River, Mass.)

Professor Finger recently reported three cases of syphilis in which there appeared peculiar and somewhat serious symptoms affecting the organs of hearing. It must, therefore, be our most diligent study to determine as early and as surely as possible, whether, in the presence of such symptoms, we have to do with poisonous action of the arsenobenzol upon the auditory nerve or not. I may be able to contribute some material which will aid in the clearing up of this question. For a period of six years I have constantly collected clinical and, as far as it was possible, anatomic material for the study of syphilitic diseases of the ear, and this material is for the most part already prepared for publication in the "Handbook of Genital Diseases."

Up to the year 1907 my material consisted of all those cases of syphilis which for purposes of diagnosis were sent from the two dermatologic clinics of the Vienna General Hospital to the Ear Clinic. Through the kindness of my colleagues of the Policlinic, privatdocent Dr. Nobl and privatdocent Dr. Brandweiner, I have had the opportunity to observe all the cases of syphilis appearing there since 1907. During the years 1907-1908 I also had the opportunity of examining the material from the clinic of Professor Finger. This gave me the opportunity to observe and diagnose those forms of disease of the ear, and especially of the auditory nerve, which give so few symptoms, and these so rapidly disappearing, that the patient does not usually apply for treatment. For this reason such ear symptoms are easily overlooked. Finally, my material consists also of those cases in which the patient complained of trouble in the ear either at the time of or since the syphilitic infection that have applied for treatment at the ear department of the Policlinic since 1907.

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*A paper presented before the Gesellschaft fuer Aerzte, Vienna, December 6, 1910.

A short time before the paper of Professor Finger was published he asked me the following important question, "Before we had the Ehrlich-Hata remedy '606' you had for a long time the opportunity to observe, and to methodically examine, my clinical material. Have you seen during this time any cases similar to those which I observed after the use of the injection?" This question I now answer. My observed material of syphilis of the ear, excluding those cases of diseases of the ear metaluetic in character (i. e., of tabes and paralysis), consist of sixty-eight cases. These have all been thoroughly examined and observed for quite a long time so that I am able to draw conclusions of both diagnostic and prognostic significance. In the course of the last six years I have seen twelve cases of ear disease appearing in the early stages of syphilis. Three of these cases showed disease of the external and middle ear, but in comparison with the cases reported by Professor Finger and Professor Urbantschitsch they show less severe affections of the auditory nerve and are, therefore, to be excluded. Comparing, now, my remaining nine cases with the three of Professor Finger, I obtain the following results: My nine cases represent a period of observation of six years; the three cases of Professor Finger of six months. In one of Professor Finger's cases the syphilis was of six weeks' duration; in the other two it was of three months' duration. Among my nine cases I can find only one in which the ear disturbance developed after thirteen weeks. In all the other cases in which the disturbance of hearing came during the early stage of the syphilis, it did not appear earlier than the fourth, fifth or sixth month.

We will now compare them as regards severity. Four of the cases showed a very slight degree of disturbance of the auditory nerve, slight dizziness or a slight degree of deafness, with subjective noises and a rapid favorable result. Serious or severe ear disease, as in Professor Finger's cases, I have observed in only five of my cases. One of them was treated with atoxyl; in the other four the symptoms appeared after the ordinary forms of mercurial treatment by inunction or injection. From this it follows that acute syphilitic neuritis of the auditory nerve, whether localized in the cochlear or vestibular portion of the nerve, is, in the early stages of syphilis, very rare. During a period of six years, and with a much larger material, I have seen only one case more (5) with vestibular symptoms than has Professor Finger with his arsenobenzol-treated material during six months. In the literature up to the present time, cases of labyrinth syphilis, i. e., syphilitic inflammation of the auditory nerve in the early stages of syphilis, have been almost unknown. In his book on Ménière's symptom-complex, von Frankl-Hochwart surveys forty cases of syphilis. The symptom-complex of Ménière is nothing else than a disease of the labyrinth or the vestibular nerve, and the entire forty cases of von Frankl-Hochwart are those of chronic or latent syphilis. Professor v. Frankl-Hochwart has told me that he has never observed the Ménière symptom-complex in an early stage of syphilis. Politzer has reported the appearance of labyrinth syphilis in one case of syphilis of seven days' duration. This observation was made in 1878 and is, up to the present time, unique.

From the foregoing it is certain that the cases reported by Professor Finger, in so far as they are cases of disease of the auditory nerve in an early stage of syphilis, must be considered to have an etiologic relation to the arsenobenzol. It is not yet possible to assume with absolute certainty if during antisyphilitic treatment severe labyrinthine symptoms appear, that such symptoms are of necessity due to the treatment. Should one, however, defend this assumption, he must admit that it is possible to have, as Professor Riehl has rightly pointed out, severe cases of Ménière's symptoms, the severe acute forms of auditory nerve disturbance, even absolute deafness after or during the usual mercurial treatment. Among my material I recall two such cases, in both of which severe Ménière's symptom-complex appeared during the usual mercurial treatment. Both were, however, as are the other cases in the literature, cases of long-standing syphilis.

I now come to the consideration of my own observations on patients treated with arsenobenzol. These observations are based on the cases of syphilis treated by privatdocent Dr. Nobl.

with arsenobenzol, seventy-two in number. Regarding the other peculiarities of his observations he has already spoken. Of the seventy-two cases, there was only one in which, after the injection, symptoms of disease appeared in the organ of hearing.

The patient was a seamstress thirty years of age who acquired syphilis in the spring of 1910 and had injections of mercury. At the end of July disturbances of hearing appeared in the right ear. She complained of deafness and disagreeable tinnitus, increased by movements of the head. Dizziness was also produced by movements of the head and she had the feeling as though something was turning inside the head; she staggered toward the right side but did not observe any turning of herself or apparent rotation of the surroundings. She had neither nausea nor vomiting. There was at this time some disturbance of vision in the right eye. The patient came to my clinic early in August. Examination showed disease of the right auditory nerve in the cochlear as well as the vestibular portion. At this time the left ear was absolutely normal. Under treatment by Dr. von Zumbusch in the Rudolphspital the right-sided ear affection completely healed. She heard perfectly well in each ear and remained free of all symptoms until Oct. 2. On Oct. 16 she came to the clinic with the history that the right ear had remained completely healed but that on the afternoon of the 2d of October she suddenly noticed that she heard badly in the left ear and at the same time severe noises appeared. Examination at this time showed the right ear to be normal in every way while the hearing power of the left ear was greatly diminished (cochlear affection), but there were no vestibular symptoms to be attributed to the left side. The same day, Oct. 16, she received from Dr. Nobl an injection of the Ehrlich-Hata "606." After the injection the noises in the left ear stopped; she thought also that she heard better in the left side. Several days later sharp pains in the left ear came on, these extended down the neck and on to the back of the head and have continued up to the present time (Dec. 6) almost unchanged. On rising on November 10 she noticed that she heard very badly in the left ear, and the noises were as bad as in the beginning. On her way to the Polyclinic she had a severe attack of dizziness so that she very nearly fell to the ground; articles about her seemed to turn to the right and she has had more or less dizziness since. On this date there was also some fever. Since Nov. 11 she has vomited two or three times daily. The dizziness is increased by changes of position, the attacks becoming paroxysmal on standing up or lying down, while during complete rest there is occasional freedom from the dizziness. Examination of the ear on Nov. 11 showed that the originally diseased right ear remained absolutely normal; on the other hand, the left ear had completely lost its function and the vestibular apparatus and the vestibular nerve did not react. This condition remains now, Dec. 6, unchanged. Since the middle of November there is also present a paralysis of the left facial nerve in all three branches. The paralysis is not complete, and the reaction to the faradic current still remains.

We have here a clinical picture under observation from the very beginning, as the patient before the Ehrlich-Hata injection had already, in the early stage of the syphilis, symptoms of disease in the inner ear of the right side. These symptoms affected the right ear only, and after treatment by mercury they entirely disappeared and complete healing took place.

Later, however, although still in the early stage of the syphilis, similar symptoms appeared in the left ear and became very much worse after the Ehrlich-Hata injection. Following this injection the disease extended itself over the entire area of the left auditory nerve and finally resulted in deafness and complete loss of function in the labyrinth of that side.

I think this case is suitable for bringing to our understanding the part which the arsenobenzol played as the etiologic factor in the production of the ear disease. It is important to notice that the arsenobenzol was given at the time when the left auditory nerve was acutely diseased. In my opinion the previously existing disease of the vestibular nerve presented a point of weakened resistance to the action of the arsenobenzol. The right auditory nerve, which was healed at the time, was not affected, but the left, already diseased ear was made much worse after the injection; hence we come to the conclusion that in cases of recent syphilis where there is already disease of the auditory nerve there is danger that the disease of the nerve will be made much worse by the use of the arsenobenzol.

Further observations will be necessary to determine whether this danger exists only in the presence of already existing syphilitic disease of the auditory nerve, as in my case, or whether an already existing nonsyphilitic disease of the auditory nerve affords a predisposition or probability that the disease of the nerve will be made worse by the use of the arsenobenzol.

When one considers the experiments made with arsazetin, it seems probable that there is some danger of making the condition worse in every case in which at the time of the arsenobenzol injection there is already present disease of the auditory nerve, whether syphilitic or otherwise.

Ehrlich produced, by injecting white mice with arsazetin, phenomena similar to those of the true Japanese dancing mouse. Röthig has examined the central nervous system of the arsazetin-injected mouse after the plan of the work of Kreidel and myself on the ear of the Japanese dancing mouse. As an anatomic basis for the dancing movements of the arsazetin-injected mouse he found degeneration of the central fibers of the vestibular nerve. In order to answer the question why, apart from the optic nerve, the arsazetin finds its point of attack in the vestibular nerve in the white mouse, he examined the vestibular nerve in a larger number of normal white mice. He found that in the white mouse there was already beginning a certain amount of vestibular degeneration. The arsazetin finds, therefore, in the vestibular nerve of the ordinary white mouse, a point of lessened resistance. This explains, according to Röthig, why, after the arsazetin injection, there appears at once in the white mouse a severe degeneration in the vestibular nerve and at the same time a disturbance in the turning movements. From these conclusions we come to the following theory. It is not to be expected that a previously sound auditory nerve will be destroyed by the arsenobenzol injection. On the other hand, an unfavorable action from the arsenobenzol is to be feared whenever the auditory nerve is diseased previous to the use of the arsenobenzol.

Finally, I wish to state my own standpoint as an otologist with reference to the manner of the action of arsenobenzol upon syphilitic ear patients. More and more often is the question asked whether, in a case of syphilitic ear disease, the Ehrlich-Hata injection is indicated or not. After the preceding observations, which naturally do not give an absolute finding, it is to be recommended to use caution in cases of acute syphilitic disease of the auditory nerve. Especially is caution in the use of the remedy to be recommended in the presence of acute or chronic disease of the auditory nerve in cases of recent syphilis, as here it is to be feared that the ear symptoms will be made worse. It appears to make no difference whether the disease of the auditory nerve is of itself of syphilitic origin or not.

An unfavorable influence is also to be feared in cases of acute syphilitic affection of the auditory nerve in old cases of syphilis or latent chronic syphilis. In cases of hereditary syphilis it is also to be recommended in the presence of acute manifestations of trouble with the auditory nerve to wait before giving the Ehrlich-Hata injection.

On the other hand, there are a large number of cases of ear disease in which the previously described dangers from the arsenobenzol injection cannot be considered as dependent upon it. Here belong the cases of chronic syphilitic affection of the auditory nerve with slight diminution of hearing power and considerable tinnitus, as well as the cases of chronic labyrinth dizziness. I would only mention that in these cases we had good results from treatment before the time when "606" achieved good results.

Finally, the Ehrlich-Hata has a good effect in cases of chronic labyrinth disease in chronic syphilis. The good results reported by Professor Urbantschitsch in one case of hereditary syphilis and in two cases of cochlear disease and chronic syphilis encourage us to proceed farther along the path already laid out.

NOTES BY THE TRANSLATOR.

The three cases of Professor Finger to which reference is made were those cases out of 170 treated with "606" which showed ear symptoms after the injection.

CASE I, male, twenty-two years, came to the clinic Aug. 20, 1910, with cutaneous syphilis and osteoperiostitis of the tibia. Aug. 24, 0.5 neutral Ehrlich-Hata injected. Aug. 25, nystagmus, dizziness, typical falling symptoms, but with intact hearing. Diagnosis by the Ear Clinic: Isolated disturbance in function of the vestibular nerve. Complete recovery in a few days.

Case II, male, twenty-five years of age, syphilis six weeks. Aug. 27, 1910, 0.45 Ehrlich-Hata, method of Wechselmann, injected. Sept. 8, initial lesion healed, patient discharged. No sign of secondary syphilis up to Nov. 2, and Wassermann negative. On this date, nine weeks after the injection, and three months after the infection, dizziness and deafness appeared. At the Ear Clinic the diagnosis of bilateral labyrinthine deafness was made. The condition remains unchanged.

Case III, female, eighteen years, came Aug. 1 for macular type of syphilis of three months' duration. Aug. 5, 0.45 neutral Ehrlich-Hata, method of Wechselmann, injected. Aug. 17, all signs of syphilis had disappeared and she was discharged cured. On Nov. 3 she was free from syphilis. Wassermann reaction negative. Nov. 3, complained of dizziness, headache, and the Ear Clinic made a diagnosis of labyrinthine deafness, dizziness and spontaneous nystagmus. There is no improvement at time of reporting, Nov. 27, 1910. (Wien. klin. Wochenschr., No. 47 and No. 51; 1910.)

At a subsequent meeting of the Gesellschaft für Aerzte in Vienna, before which Professor Finger's paper was read, some other cases in addition to those of Professor Alexander were reported where ear disease had appeared as late manifestations after the use of the Ehrlich-Hata.

v. Zumbusch had found in the literature, among 7,000 cases from twenty-five clinics, 9 cases of auditory nerve disturbance, all being cases with secondary manifestations from second to seventh month, and in most cases the Wassermann was negative.

Dr. H. Frey reported a patient injected on Aug. 9 with 0.5 arsenobenzol who returned late in October with deafness and some vestibular nystagmus. This case later showed the exanthemata of syphilis so that Dr. Frey was not certain that these manifestations could be laid to the arsenobenzol. (Wien. klin. Wochenschr., No. 50, 1910.)

Through the kindness of Dr. Daniel Kaufmann, I was given the opportunity of seeing two cases, each of whom had deafness and labyrinthine symptoms some time after the Ehrlich-Hata injection. At the time of the appearance of these symptoms the Wassermann reaction was positive. Both patients were given mercury by injection, and when I saw them all symptoms were improving. Here it might be difficult to say whether the ear symptoms were due to the arsenobenzol or to the uncured syphilis. In Dr. Kaufmann's opinion they were due to the arsenobenzol.

Professor Rille, of Leipzig, has recently reported (Berl. klin. Wochenschr, Dec. 12, 1910) three cases of ear involvement which may be briefly referred to:

CASE I, female, twenty-one years old, with no previous ear symptoms, maculopapular syphilide with involvement of the tonsil, was given an injection of Ehrlich-Hata, July 7, 1910. Four weeks after the injection, 0.45 gr., there appeared dizziness, noises in ear and deafness located largely in the right ear, where both air and bone conduction were lost. Later there appeared a partial facial paralysis and symptoms of choked disk in the right eye. Up to Nov. 15 there had been some improvement, there is some bone conduction, but conversation speech is not heard. The left ear is normal.

CASE II, female, eighteen years old. Ehrlich-Hata injection, 0.45, on July 10. On Oct. 10 pain in head and dizziness appeared and on the following day right-sided facial paralysis, followed in three days by optic neuritis. Under treatment with mercurial ointment the facial paralysis and other symptoms disappeared, Nov. 17, discharged cured.

CASE III, male, thirty-three years old. Injection of 0.7 Ehrlich-Hata, July 7. In middle of October there suddenly appeared a high degree of double-sided labyrinthine deafness at which his previous occupation, that of blacksmith, may have predisposed.

XXXIII.

A PRELIMINARY REPORT OF SOME TWO YEARS' EXPERIENCE IN MODIFIED BLOOD-CLOT SURGERY OF THE MASTOID REGION, WITH PRESENTATION OF CASES.

By Hugh B. Blackwell, M. D.,

New York City.

The following report is based upon a study of some 33 cases operated upon by myself during the past two years. They occurred upon the services of Dr. Robert Lewis of the New York Eye and Ear Infirmary, and Dr. A. B. Duel of the Manhattan Eye, Ear and Throat Hospital.

The three essential factors which make for success in all modified blood-clot operations on the mastoid bone are:

1st. General condition of the patient.
2d. Operation and operative technic.
3rd. Postoperative care and dressing.

1st. General condition of patient: All conditions of low bodily vitality with which there may or may not be associated a blood dyscrasia following an acute, or occurring in the course of a chronic, constitutional disease, are poor subjects for an attempt at blood-clot healing. There are practically no local contraindications to the use of this method, save in the presence of the gravest intracranial complications of aural disease. The presence of a subperiosteal abscess, exposed sinus or dura in the wound, or even a perisinus or epidural abscess, are not in themselves deterrent factors. It is, in fact, among the latter class of cases that the best results in point of time of healing occurred, no doubt due to the great increase in the vascularity of the walls of the cavity which is existent under these conditions.

2nd Factor. Operation and operative technic. This consists in, first, the rapid performance of a thorough mastoidectomy; by this we not only conserve the energies of our patient, but at the same time leave him with a reasonably clean cavity filled with sterile blood with which to begin the work of regeneration, a work that he would be in no condition to take up were his strength exhausted by a previous prolonged surgical procedure. In addition, for reasons to be subsequently stated, the posterior bony wall of the external auditory canal is markedly lowered, the region of the antrum is thoroughly curetted out and the intratympanic masses of granulation tissue lying anterior to the antrum are removed until the short process of the incus becomes freely visible. At the conclusion of the operation frequently a myringotomy is performed, and the external auditory canal is always packed with plain gauze dipped in normal saline solution. The mastoid cavity is cleansed and a strip of iodoform gauze one-half inch wide, folded once, is laid in the bottom of the wound almost to the antrum, being brought out at the inferior angle. The cavity is then allowed to fill with blood and the incision is united down to within half an inch of its inferior extremity.

3rd Factor. The postoperative care and dressing. At the conclusion of the operation the concha is completely filled with a little pyramid of wet saline gauze. Similar gauze, folded, is laid parallel and posterior to the united edges of the wound. This is added to until it attains the height of the mass of gauze in the concha. No gauze is laid directly over the united edges of the wound. Loose layers of wet gauze are then laid over all. When the bandage is applied, it will be found that the pressure over the posterior mass of gauze draws forward the scalp tissues which lie behind the line of incision, and that the pressure over the pyramidal shaped mass in the concha forces that structure, together with the canal, inward and backward, thus diminishing the size of the mastoid cavity, a feat which would be mechanically impossible were the posterior auditory canal not previously lowered. Owing to this sinking in of the auricle and anterior flap, we secure a continuous layer of soft parts down to the antrum, a most valuable asset in subsequent healing. In from twenty-four to thirty hours after the operation the wound is dressed and the posterior drain is removed. Usually from this time on only the lips of the lower one-half inch of the incision are kept open with wet gauze, none being introduced into the cavity itself, save for the purpose of keeping the incision open at this point. The sutures are generally removed at the first dressing, the external auditory canal repacked and wet dressing reapplied. At each subsequent daily dressing the canal is packed fairly tight and wet saline gauze dressings are used throughout the healing process as long as there is any evidences of much discharge.

The question of the dressing and handling of these wounds when the discharge is profuse is of considerable importance. As long as the patient is comfortable, has little or no temperature, and the soft parts around the wound present no inflammatory reaction, it is not indicated to split up the wound and pack it, no matter what the amount and character of the discharge may be. Under these circumstances one should dress the mastoid twice a day if necessary; the discharge may be removed when profuse by gently stroking the tissues over the wound with the thumb, from above downward, care being exercised not to separate the line of incision, and using wet saline gauze at each dressing. The gauze is kept moist by the external application of rubber tissue. The packing of the external auditory canal prevents its collapse and at the same time forces that structure back into the wound. One must remember that these wounds are not sealed, but that each one has an opening into its cavity placed at its most dependent portion, and that this opening is kept open. The drainage, therefore, is good. The main object of the wet dressing is that moist gauze readily absorbs the discharge, however thick, and does not stick to the edges of the incision and cake up the secretion, as dry gauze so frequently does.

Whenever packing is placed in the wound, which is very seldom, it is of the lightest character, only sufficient to produce drainage. The wound is generally freely stimulated at all times with balsam of Peru, poured in, or tincture of iodine applied with applicator. Masses of granulation tissue are never disturbed, but are encouraged as much as possible. The wound is allowed to heal as rapidly as it will, either from above downward or below upward, from within out or from without in. The advantages of this method in shortened time of healing and a better cosmetic result are obvious. There is, however, another advantage not often referred to, but which is of considerable importance to the patient, namely, that the dressings are comparatively painless, there being no packing to remove from the wound.

Of the thirty-three cases reported nineteen were adults and fourteen children under ten years. The average time of healing of twenty-two of the cases out of the thirty-three was 21 days. To the best of my recollection, the remaining eleven cases about corresponded in point of time of healing to the others. The average time of healing of the ten adults was 17 days and of twelve of the children the average time was 25 days. No case was pronounced cured until all of the posterior dressing was removed and the wound was dry.

Thirteen of the thirty-three cases had well-marked perisinus and epidural abscesses present. In nine there was a subperiosteal abscess. In six of the cases, sinus and dura were exposed in the course of the operation. Two of the cases operated upon were for recurrent mastoiditis. Two developed erysipelas, one during the third week of convalescence and the other seven days after the operation. In both of these cases the wounds were doing well when the erysipelas developed some distance from the wound. Both were mild cases. In one of the cases operated upon there was a marked dyscrasic condition present at the time of operation, so marked, in fact, that the patient was kept in the hospital for two months subsequent to the operation, owing to his general weakness and debility. The wound is doing well, though not yet healed.

None of the cases, so far as known, has shown any evidence of recurrent mastoiditis.

In conclusion, I wish to express my indebtedness and appreciation to Dr. W. S. Bryant for numerous valuable suggestions concerning these patients. Dr. Bryant saw nearly all of the cases, and it is to a large extent due to his zeal and interest that the results were obtained.

XXXIV.

THE SELECTION OF CASES OF CHRONIC SUPPURATIVE OTITIS IN WHICH OSSICULECTOMY IS INDICATED.

By O. A. M. McKimmie, M. D.,

Washington.

During the past ten years the radical mastoid operation for chronic suppurative otitis has been popularized to such an extent that other measures for the relief of this condition have been cast aside and almost forgotten. Medical men, like others, like to be in style; and the result has been that many of us have taken up new operations and made cases fit operations rather than operations fit cases.

Careful study of my own radical mastoid operations and those of my colleagues with whom I am closely associated has impressed upon me the fact that many of the cases operated on show no extension of the diseased process beyond the middle ear. In other words, the aditus, antrum and mastoid cells are frequently healthy so far as macroscopic appearances are concerned.

As a result I have tried to formulate some definite rules for my own guidance in selecting cases for the radical operation and those in which some less extensive operative procedure would be applicable.

In discussing this matter I am taking for granted that we are only considering cases in which local and general medical treatment and mechanical measures have been faithfully tried and have failed.

The necessity for operation of any kind may be discussed under three heads—

1. The cure of an annoying and possibly dangerous condition.

2. The prevention of complications from the extension of the diseased process.

3. Preservation or restoration of hearing.

I believe that the majority of otologists will agree that a patient with a chronic purulent ear is rarely in normal health. Not only is he affected mentally by the consciousness of his trouble, but is also subject to the physical discomfort of the discharge. His digestion is affected by the flowing of pus into his nasopharynx, where it runs down and is swallowed, and he suffers from a continuous mild chronic toxemia from absorption locally.

The extension of infection to neighboring structures is always a possibility in these cases and, while not so common as in cases of acute middle ear suppuration, is of sufficient frequency to demand a cure. The surgical measures for the cure of chronic suppurative otitis comprise ossiculectomy, the simple mastoid operation, the radical mastoid operation, and the Heath operation or some of its modifications. It is my belief that we can so classify our cases that we can definitely determine which cases are best treated by some one of the first three. Of the Heath operation I can only say that I have not employed it, and believe that the cases which Mr. Heath considers suitable for operation by his method are curable by the simple mastoid operation.

Kopetzky in a very able critique of the Heath operation, read before the Southern Section of this Society in 1909, gave a very clear exposition of the fact that in the cases indicated by Mr. Heath his method gave no better results as to hearing or cure of the suppuration than does the simple mastoid operation.

The question of hearing is a very important one to consider in determining between the radical operation and ossiculectomy. I am firmly convinced that hearing is improved, or at least not made worse, by ossiculectomy; while the radical operation shows a large percentage in which hearing is markedly diminished after operation.

The simple mastoid operation does not involve disturbance of the anatomic relations of the middle ear, and hearing is likely to be improved rather than diminished, or at least left in the condition existing before operation.

In cases without symptoms of internal ear, sigmoid sinus or brain involvement, when careful observation leads to the conclusion that the ossicles are intact, the discharge being profuse and of long standing but without offensive odor, the simple mastoid operation offers a reasonable hope of complete cure without lessening the existing hearing and the probability of improving it.

In cases in which the mucous membrane rather than the bone is involved, there exists simply the need for efficient drainage which the simple mastoid operation provides.

There remain for consideration ossiculectomy and the radical mastoid operation.

Before stating my conclusions as to indications for ossiculectomy, it might be well to state what I consider contraindications.

Contraindications are:

1. A contracted auditory canal which would render the performance of ossiculectomy difficult, dangerous or even impossible. The attempt to operate under these conditions might result in impaction of the stapes, perforation of the round or oval windows, or injury to the facial nerve.

2. The presence of cholesteatoma.

3. Recurrent or persistent labyrinthine symptoms.

4. Discharge of foul odor and of greater quantity than could be produced in the middle ear.

5. Demonstrable caries of the roof of the posterior portion of the attic.

6. Caries of the posterior superior portion of the tympanic ring.

A contracted canal renders a perfect view of the operative field well nigh impossible; and it is dangerous in the extreme to trust to the sense of touch when working in the neighborhood of so many important structures.

If the foot plate of the stapes is present it may be impacted, or the round or oval window or even the facial nerve may be injured in searching for the remains of the incus, so that unless the canal be of sufficient size to permit a fair view of the field, ossiculectomy should not be attempted.

Cholesteatoma is a very positive contraindication because it is impossible to know how far the cholesteatomatous mass extends from the existing perforation or how deeply its pressure may have caused disappearance of bone.

In any operative case presenting labyrinthine symptoms any procedure to be of value must give sufficient exposure to enable us to inspect the horizontal semicircular canal and labyrinth windows, and this ossiculectomy does not do.

Persistent foul smelling discharge of great quantity indicates extensive involvement of the accessory cavities of the ear and demands some operation which will fully expose them.

Dead bone in the posterior part of the attic is in such proximity to the external semicircular canal and facial nerve canal as to make its thorough removal extremely hazardous unless it be done under direct inspection.

In general terms these contraindications to ossiculectomy may be considered indications for the radical mastoid operation.

The indications for ossiculectomy are:

1. Caries of the ossicles.
2. Intractable discharge of not greater quantity than could be produced in the middle ear.
3. Perforation in Shrapnell's membrane with odorous discharge and marked deafness.
4. Recurring granulation polypi.
5. Adherent malleus with marked deafness.
6. Large kidney shaped loss of drum membrane with the remains of the ossicles blocking the attic.
7. Recurring middle ear vertigo caused by thickened discharge or granulation pressing on the round window.

Perhaps the commonest cause of chronic suppuration of the ear is caries of the malleus or incus or of both of these bones. Caries of the malleus handle is readily recognized, and if the perforation is in the upper portion of the vibrating membrane or in Shrapnell's membrane, disease of the neck and head of this ossicle is easily diagnosed.

When the perforation involves the superior posterior quadrant of the drum the long process of the incus can be seen and its condition determined with the probe. In some cases, however, the long process has disappeared and the body of the incus lies too high to be seen or its condition or even its presence to be determined with certainty by the use of the probe. In other cases the posterior part of the tympanic ring projects so far forward as to hide the incudostapedial joint.

In such cases if the tympanic ring is intact, I believe ossiculectomy is preferable to the radical operation.

Many cases present a perforation so small or so situated that efficient cleansing of the middle ear cannot be effected and the condition of the ossicles cannot be determined with certainty, the discharge, however, indicating by its persistence and odor the probability of disease of some bony structure.

These cases are particularly dangerous inasmuch as the drainage may become blocked at any time and so give rise to acute mastoid disease or spread of the infection to sigmoid sinus, internal ear, meninges or brain.

A perforation in Shrapnell's membrane indicates disease of the neck or head of the malleus or of the body of the incus. Not infrequently the head has disappeared as a result of the suppurative process and one can look through the perforation and see the internal wall of the middle ear. The hearing is affected not only by the chronic inflammatory changes in the cavity but also by the fact that the opening is so high that the cavity can never fully discharge itself.

I have one specimen, removed from the right ear of a colleague, which shows the whole of the drum membrane, except for a defect just above the short process, a carious short process and handle to which the body of the incus is joined by bony union. In this case the head of the malleus having been destroyed and both processes of the incus having been separated by the carious process, the body of the incus dropped and became attached in the position described.

A granulation polypus presenting through a perforation is practically always indicative of carious bone and nature's effort to cure it. The site of the base of the granulation is a matter of importance. If it springs from the internal wall of the middle ear or projects through a perforation in Shrapnell's membrane and keeps recurring after removal, I consider the case one suitable for ossiculectomy.

On the other hand, if it comes through an opening in the upper posterior part of the drum, I consider the radical mastoid operation indicated. Adhesion of the malleus handle to the internal wall of the ear is not only destructive of hearing but in itself may prove a distinct menace to life itself by gradually blocking drainage from above and causing pocketing and retention of secretions and thus may lead to extension of the infective process.

The number of patients showing almost complete disappearance of the vibrating portion of the drum, with the carious shortened malleus handle presenting at the margin of a large kidney shaped perforation, is large, especially in cases of long standing.

Such cases are apt to present an attic packed with granulations and the remains of the malleus head and sometimes part of the incus which not only keep up discharge but tend to block up the aditus and prevent healing of possibly superficial and otherwise curable caries in that neighborhood.

A relatively small number of cases present occasional attacks of vertigo coincident with diminished discharge due to thickness of the discharge itself or to its crusting over the perforation.

This brings about accumulation of the discharge in the middle ear and resultant increased labyrinthine pressure by way of the round or oval windows.

In presenting these remarks I do not wish to be understood as decrying the radical mastoid operation. I freely admit that some cases which are subjected to ossiculectomy eventually require the radical operation; many, however, are cured by the simpler operation in which the risks are far less. Careful consideration of the indications outlined will, I believe, enable us to select those cases in which ossiculectomy is indicated and those in which the radical operation is to be elected.

XXXV.

REPORT OF THREE CASES OF REMOVAL OF COINS FROM THE ESOPHAGUS OF INFANTS BY A SIMPLE PROCEDURE.

By Harry L. Myers, M. D.,

Norfolk.

In view of the very tender age of the patients, the similarity of the cases, the almost universal existence of the one necessary instrument and, most important of all, the ease of the procedure, I feel that it may not be uninteresting to report the extraction of a coin from the esophagus in the cases of three infants. In recommending a procedure based on the success of only three cases, I realize that my position is not a strong one, but the gravity of the condition, its common occurrence and the frequent lack of the proper instruments for esophagoscopy with the requisite skill for its successful employment, gives me courage to report a procedure which, on account of its simplicity, is within reach of every surgeon who may be called upon to meet this troublesome emergency.

Case I.—On July 12, 1906, A. W., a colored male about 18 months, was brought to me by its family physician with a history of regurgitation of food and difficulty in swallowing for several days. The patient was somewhat fretful but otherwise presented no serious symptoms. Feeling confident that the child had some foreign body in the esophagus, resort was had to the X-ray and a coin shaped body was located in the esophagus lying laterally and situated well down near the stomach. The patient was taken to the hospital and chloroform administered. With the child lying on its back and its head extended over the end of the table, I passed several different kinds of esophageal forceps and succeeded in touching the foreign body, but failed to grasp it after many trials. Fearing to continue too long this manipulation and failing to extract the coin, I decided to attempt to push it on to the stomach, believing that nature would be more successful in delivering it in the downward direction than I had been from above. To this end I introduced an olive pointed flexible esophageal bougie. I could feel it touch the top rim of the coin, hold momentarily and then slip by it; but when I attempted to pull it back to the top again, I found that it required some effort to withdraw it. Realizing that the olive point was beyond the coin and that the resistance to the withdrawal of the instrument could only be due to its having engaged the lower edge of the coin, I pulled very steadily to prevent its losing its scant hold; at the same time stopping the anesthesia to allow the reflex to assist by contracting the tube. The gradual steady pull resulted in the extraction of a penny. There was no bloody mucus or other evidences of trauma and recovery was uneventful.

Case II occurred in the practice of a colleague, who asked me to bring over any instruments I might have for extracting foreign bodies from the esophagus. The infant, a white male child, aged 10 months, presented the history of having had a penny in the throat for six days. Swallowing was difficult and most of its food regurgitated. The baby notwithstanding this showed no other serious symptoms. A skiagraph showed the coin situated about two inches below the larnyx, lying laterally in the esophagus. Ether was administered and with the baby on its back and head extended over the table, each of the three of us present took a turn at the removal of the coin with forceps and the flexible bougie I had used in case No. 1, but with no result. In casting about for some other means I noticed a conical urethral bougie with a long wire-like handle, and it occurred to me that it might be successful; so I asked and received permission to try it. Passing the forefinger of my left hand down over the epiglottis and pushing forward the larynx, I passed the bougie held in my right hand along the finger as a guide and had no difficulty in forcing the conical end by the cricoid into the esophagus. The instrument passed beyond the coin without difficulty and I could feel the lower edge of the coin click into place over the proximal end of the cone. A steady pull delivered the coin without difficulty and with only a slightly bloody tinged mucus. The recovery was uneventful.

Case III occurred in the practice of Dr. E. A. Land, by whose permission I report it.

A. B., a colored infant, male, about 10 months old, swallowed a five cent piece three days before being brought in for treatment. Symptoms—regurgitation of food; great difficulty in swallowing. It was observed that there was also considerable rigidity of the right sternomastoid muscle. A skiagraph showed the coin located in the esophagus about the level of the cricoid cartilage and lying in the horizontal plane. Having heard of the success of the bougie in case No. 2, the surgeon sent to a colleague for an instrument of this kind and made an attempt to use it without anesthesia; but owing to the rigidity of the muscles, and, I think, also to the position of the coin just behind the larynx, he did not succeed in passing it beyond the coin, although he could touch it. The child was then subjected to chloroform anesthesia and placed on its back with the head extended over the end of the table and a smaller bougie was tried. This passed easily and engaged the coin without difficulty. Considerable traction was required to extract the coin in this case, but it was accomplished without injury as in the other cases.

Admitting that esophagoscopy and modern forceps coupled with the requisite skill in their use, would be the better method in most cases of extraction of foreign bodies from the esophagus, I believe in cases of the nature of these just reported, that no method offers better chances of success and certainly this means leaves nothing to be desired in its simplicity.

XXXVI.

OSTEOFIBROMA OCCUPYING THE TONSILLAR FOSSA (PROBABLY OF STYLOID PROCESS).*

By A. L. Kelsey, B. S., M. D.,

Los Angeles.

The report I have the honor of presenting to you is that of an osteofibroma of considerable size occupying an expanded tonsillar fossa. The report is made not because of any peculiar circumstance accompanying the case, but as a record of one more example of a rare occurrence in this region.

Tumors of all varieties occur rather frequently in the various parts of the upper respiratory tract, and the tonsil itself is often the seat of these growths. Fibromata originating in the connective tissue of the tonsil or in its capsule are seen rather frequently. Bony or cartilaginous formations are often found in the tonsil, but after a fairly good search of the literature of the tonsillar region, I have not found a single case of a distinctive osteofibroma mentioned. I have no doubt that there may be a record of the occurrence of this tumor in the tonsil itself, but it must be rare. The occurrence of the same tumor in the tonsillar fossa and not involving the tonsil itself must occur much less frequently, because of the anatomic and pathologic conditions existing in this space.

Since, in the case under discussion, neither the tonsil nor its capsule was involved in the growth, it is rather to be presumed that its origin was in the styloid process; as it contains the necessary elements and is sometimes found prolonged into the tonsillar sinus, where it would be subjected to irritation and inflammation transmitted from the tonsil itself.

As will be seen later there was a history of prolonged tonsillar trouble in this case and, taking all things into consideration, I am strongly inclined to believe this to be an osteo-

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***Read before the Western Section of the American Laryngological, Otological and Rhinological Society at Los Angeles, December, 1910.**

fibroma of the styloid process; although the presence of a normal styloid was not demonstrated at the time of operation or afterward, leaving the question more in doubt than it should have been.

The patient, Mrs. B., age 49, was seen first September 5, 1910, and the following history was elicited: She had been a goitre subject since the age of 12 and had never been strong and robust. Six years ago she was ill for a month with a swollen right tonsil which showed an ulcer, almost gangrenous in character at its center, which healed under treatment by her physician. The patient says that one year ago there was again severe trouble with this tonsil and an abscess broke. Since this she had attacks of pain at intervals of a week or so in the right side of the neck and head.

Eight months ago, according to her physician, there began an attack of soreness and pain in this tonsil which was treated twice a week up to July, 1910. About the middle of June he noticed for the first time some enlargement in the region of the upper end of the tonsillar fossa, and advised a consultation. The consultation was postponed by the patient until September 5th because there was not and never had been much suffering. About the middle of August the patient noticed some enlargement externally in the depression behind the jaw.

Examination.—Patient rather thin and frail, though active and feeling quite as usual for her. A moderate size goiter is present without eye symptoms. Externally the space behind the angle of the jaw on right side does not show as deep a depression as on the left and feels firmer. Pharynx, nasopharynx and mouth in good condition. Right tonsil covered almost completely by a thick plica triangularis and the portion seen is lower than usual. Above tonsillar fossa the palate is bulged out by a mass the size of a walnut. No active inflammation is indicated. On palpation the idea is conveyed that there is a hard immovable mass present which is slightly lobulated and is as large as a walnut with the hull on. The mucosa over the mass is movable, but the tonsil cannot be further exposed by traction on the anterior pillar.

Because of the history, which indicated an apparently rapid growth, and for other reasons, a tentative diagnosis of sarcoma of the tonsil was made and its removal was advised.

The patient did not appear again for some weeks, when Dr.

E. W. Flemming was called in consultation and agreed with the diagnosis.

At a subsequent visit, some days later, it seemed to me that the mass was an outgrowth from the upper pole of the tonsil and that the mass of the tonsil was not involved. The patient at this was pronounced by Dr. Frank Bullard a fit subject for etherization.

October 14th the operation was done, with Dr. Bullard giving ether and Dr. Flemming and Dr. Eddy, the attending physician, assisting.

An attempt was made to enucleate the mass as a tonsil is enucleated, but it was soon found that there was absolutely no plane of cleavage between the tumor and the fossa. At this time I should mention that it was found the tonsil was very small and resting on the lower pole of the tumor. A distinct capsule was soon found, incised and peeled from the mass as far as space would permit. The tumor proved to be larger than thought and was so firmly wedged into its bed as to be utterly immovable by traction on a stout volsellum. The enucleation was finally accomplished after much difficulty by means of the Yankauer blunt tonsil dissector, hugging well the external surface of the mass, and guided by the finger.

The tumor extended outward and backward, occupying fully the space between the spinal column and the jaw and rested on the sheath of the internal carotid artery which could be seen pulsating after its removal.

The tumor measured 4 cm. in all diameters except the anteroposterior, which was 3 cm., and found to contain much hard fibrous tissue with considerable bone, and was pronounced by Dr. S. P. Black to be an osteofibroma. The bone extended through the mass in the vertical plane, the larger amount being at the top while it was rather narrow at the bottom. The position of the bone would seem to favor the idea of the styloid process being involved.

Postoperative history.—The patient was in excellent condition when the operation was completed and remained so for two or three days, when circulatory disturbance arose, the pulse getting irregular and going as high as 160. The attack was controlled, but recurred several times later. The wound did well and the temperature ran 99 to 100° in the afternoon for a few days and then became normal. On the tenth day the pulse again became rapid, and irregular, and the patient had very slight delirium and was dull.

At 10 p. m. of this day Dr. H. G. Brainerd was called and, as the temperature was normal and the lungs showed no signs of disease, it was thought that the condition was one depending on thyroidism.

The condition was somewhat better the next day but in the evening the temperature went to 101° and she was slightly delirious and extremely restless. A slight dullness of the base of the left lung was found. From this on the patient grew rapidly worse, the temperature going up to 107°, the pulse to 160. Death resulted on the third day of this attack and on the thirteenth day after operation, evidently from a fulminating type of pneumonia.

SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Meeting of February 10, 1911.

Obituary—Charles John Kipp, M. D.

By Wells P. Eagleton, M. D.

Doctor Charles J. Kipp, whose death occurred on January 13th of this year, at the age of 72, was a man of whom American otologists can be especially proud.

Of the esteem and veneration in which he was held by the community and by the profession it is but necessary to recall that he was at different times the president of the Medical Society of New Jersey, and for many years the president of its Board of Trustees, president of the American Ophthalmological Society, of the American Otological Society, vice-president of the American Medical Association, and president of the Board of Managers of the New Jersey Sanitarium for Tubercular Diseases; the originator and first president of the Society for the Relief of Medical Men of New Jersey; the first president of the Newark Medical Library Association and of the Babies Hospital of Newark. He was the executive surgeon of the Newark Charitable Eye and Ear Infirmary, consulting surgeon of the Newark City Hospital, St. Michael's Hospital, St. Barnabas Hospital, the German Hospital, the Mountainside Hospital, and the Hospital at Sommerville.

To us as otologists his career was notable, not alone for the large amount of scientific work that he accomplished and his frequent contributions to medical literature, but especially by his having been the teacher and originator of otologic and ophthalmologic knowledge to the whole profession of the state of New Jersey.

New Jersey has no medical schools, but he supplied this want by the organization of the first eye and ear clinic held within the state, that at St. Michael's Hospital; and later by the establishment and development of the first hospital devoted exclusively to the treatment of diseases of the eye and ear, the Newark Charitable Eye and Ear Infirmary. In both of these, while under his guidance, any man anxious to work could find opportunity and incentive to grow scientifically, for by his unaided personal efforts and scientific skill he had built up first, a clinic, known all over the state, and later a hospital with a staff of twenty-five, which at the time of his death had treated over 152,000 patients, which mass of clinical material he placed at the disposal of all the profession.

It can be truly said of him that he was the father of otology and ophthalmology in New Jersey, and he gave his great knowledge unstintingly to the profession and especially to the younger men whom he from time to time added to his staff.

To my mind, it is for this furnishing of opportunity and willingness to assist scientifically for which the profession as a body is chiefly indebted to him.

His knowledge was at the command of all the profession and his presence was to them a constant stimulant and incentive to scientific work.

A Case of Otitis Media Purulenta Acuta, Mastoiditis, Perisinus Abscess, With Perforation of Premastoid Lamina Simulating Furuncle of the Canal.

DR. HUGH B. BLACKWELL. The patient presented first came to the New York Eye and Ear Infirmary some four months ago with all of the symptoms of a well marked furuncle in the external auditory canal, the drum being intact and only somewhat congested, and the hearing good in the affected ear. The point of greatest swelling was located half an inch from the external meatus on the posterior wall and its incision was followed by a free escape of pus and blood. Forty-eight hours later the condition had so improved that what little doubt there had existed as to the exact nature of the trouble was dissipated. The furuncle in the canal continued to discharge for a period of about two months, during which time the patient was constantly under observation. Finally, one day he reported at the clinic with a well-marked postauricular swelling, and was admitted to the hospital, for operation, on the service of Dr. Robert Lewis. On elevating the periosteum and retracting the auricle forward a vertical perforation was found to exist in the posterior bony canal wall at a point underneath the furuncle in the membranous canal. On removing the external mastoid cortex a well marked perisinus and epidural abscess was discovered around the line of the sinus. The antrum was apparently sealed off, there being no evidence of disease in that region. The operation was then completed and a blood clot dressing applied. At the end of eleven days all the dressing was removed and the patient was pronounced cured. A week later, however, there was some little seepage for a few days. With that exception the recovery was uneventful. Throughout the entire time during which the patient was under observation there was no perforation of the drum. In addition to showing a quick recovery in a modified blood clot operation, the case illustrates the extreme difficulty of diagnosing a mastoiditis where there has occurred a perforation in the premastoid lamina, simulating a furuncle.

DISCUSSION.

Dr. Perkins said that the case was a most interesting one, and these conditions are most difficult to diagnose. In Dr. Dench's service this fall there have been three such cases which were very puzzling. In one there had been a discharge for some time. There was a granulation in the posterior wall and when that was removed the discharge continued; the drum looked nearly normal. At no time was bare bone encountered. The first smear gave a negative result, but a later one showed streptococcus capsulatus, and the mastoid was opened and found completely disorganized. In another case the swelling in the posterior wall occurred after recovery from pneumonia; the swelling was marked and after incision there was quite a free discharge. On inserting a probe bare bone was encountered, and when the mastoid was opened a sequestrum was found almost filling it. In the third case the abscess was seen at the start and its nature suspected, and the patient was sent to the hospital. On incision two days later the probe encountered bare bone. It proved to be a streptococcus infection and the mastoid was opened and found extensively diseased. The case illustrates the importance of finding bare bone by the probe, and the bacteriologic examination. There have been cases, however, where the bacteriologic examination has been deceiving and the mastoid opened without finding disease. One cannot be too careful in treating cases showing swelling in the posterior wall of the canal. In some of these cases the pus will have been found to have dissected its way out through the Rivonian segment and to have broken posteriorly. This has been supposed to occur only in children, but a case not included in those referred to had recently occurred in Dr. Dench's service in a boy of fourteen proves that it may also occur later in life.

Dr. Guntzer inquired whether there were any external symptoms of middle ear disease.

Dr. Perkins replied that the second case had a middle ear discharge; in the first, middle ear was intact, so that a furuncle was suspected, and only when the bacteriologic examination revealed streptococcus capsulatus was the condition recognized. In the third case the mastoid was opened in the presence of a large area of bare bone and the profuseness of discharge from the incision in posterior wall.

Dr. Hopkins said that they had been making some X-ray investigations in the laboratory recently to determine if disease could be diagnosed in such cases as these, and in two-thirds of the cases they had secured very satisfactory results. The X-ray showed that the bone was diseased; the mastoid on the diseased side presented an entirely different appearance to that on the healthy side. If radiographs were made in cases like these it might help in the diagnosis.

A Speculum for the Direct Examination and Treatment of the Eustachian Tube.*

By Sidney Yankauer, M. D.

DISCUSSION.

Dr. Wilson said that he had seen Dr. Yankauer demonstrate these instruments on some patients in Boston, and had introduced the speculum himself and looked at several of the patients, and thought that if a novice like himself could see the fossæ of Rosenmüller and examine the tubes so easily, the instrument would certainly prove to be a practical one, and most useful to the aurist.

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*See page 421.

Dr. Myles said that all would hail with pleasure any instrument that would help in studying the fossæ of Rosenmüller. Some years ago he had read a paper on the fossæ of Rosenmüller and had presented photographs showing the anatomy. It is quite a frequent occurrence to see bands from the eustachian tube to the parts above; in many cases that he has examined after adenoid operations he has seen complete adhesions as the consequence of the operation; where much of the mucosa of the rhinopharynx and fossæ had been removed, the adhesions seemed greater. These can be broken best with the finger covered with a rubber cot, but they frequently recur. He hoped that Dr. Yankauer's instrument would permit the application of nitrate of silver to these points and thus aid in preventing the recurrence of the adhesions. The patients at first object to applications in this region, but after a little training become more submissive.

Dr. Berens said that from looking at the instrument and hearing Dr. Yankauer's description, he would judge that an important advance has been made not only in the treatment of the fossa of Rosenmüller but also in the treatment of the eustachian tube from the ear standpoint. His own experience had taught him that the fossa of Rosenmüller is a most important part of the anatomy, from the aurist's standpoint. He curettes them out carefully with his finger nail, and is then very careful about the after treatment. As Dr. Myles had said, the mass that has been removed is often followed by granulations, so that the patient may be worse after the treatment than if he had been let alone.

A Case of Mastoiditis Followed by Cerebral Symptoms, Relieved by Decompression Operation.*

By Charles E. Perkins, M. D.

DISCUSSION.

Dr. David E. Hoag said that the boy had been sent to him a little over a week ago by Dr. Perkins for examination to see if some light could be obtained upon the pre-existing condition from a neurologist's standpoint. He had seen him twice, and had looked him over very carefully, but found no conditions other than might be found in a normal child. Besides the examinations, he had given considerable thought to the case, and Dr. Perkins' very prompt recognition of the gravity of the symptoms and his immediate decision to operate had certainly secured most brilliant results. Dr. Perkins had asked for possible light on the pathologic conditions which had led up to the symptoms and the necessity for operation. A prominent neurologist who is now dead used to say that in certain spinal cord and brain conditions there were many times a sort of pathology which might be called speculative pathology, and in this and many other cases we can only speculate as to what has occurred. The principal signs, as Dr. Perkins gave the history, were the convulsive seizures limited to one side, practically simulating an epileptic attack, and passing into a condition of unconsciousness, and a certain amount of optic neuritis. It has been suggested that the boy may have had a typical epileptic seizure which might account for what occurred. That does not seem at all likely, for, as a rule, epilepsy does not commence at this age,—either earlier or else at the pubescent period. Again, in epilepsy the patient would not lapse into a permanent and increasing unconsciousness, but would recover. An infectious condition of the ear would lead one to think of abscess first, and yet the only symptoms displayed were the convulsive seizures and the optic neuritis. About half of the cases of abscess have convulsive attacks, but it is not the rule. Optic neuritis is not usually found in cases of cerebral abscess that run a rapid course, nor where the abscess is small. Then tumor might be thought of, ordinary tumor of the brain; that is a slow growth, and the optic neuritis is more intense in such cases. Usually vomiting is a symptom, and persistent and long-continued headache, and usually the mentality is defective. None of these occurred, so tumor might be left out. The only thing left was a meningeal congestion,—possibly an infective localized meningitis. If it was an epileptic attack and was relieved by Dr. Perkins' decompression operation, it is another case in which it was wise to do the decompression operation. It would seem that in this case there was an infective localized meningitis, following middle ear infection.

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*See page 432.

It will be recalled that Dr. Perkins' operation led him into the vicinity of the temporosphenoidal lobe, the most likely location for abscess following infectious conditions of the middle ear, but as no pus was found that would throw out abscess. The pathology of abscess and infectious meningitis is closely interwoven, and as to when one or the other occurs depends partly upon the intensity and rapidity of the inflammatory action and the nature of the microorganism and the virulence of its action.

Dr. Eagleton said that if the fact that the cerebrospinal fluid was tinged with blood, and was not due to a faulty technic, then this would be of assistance in making the diagnosis. He had seen two cases in the Newark Charitable Eye and Ear Infirmary where the presence of blood in the fluid had preceded the death of the patient by a few hours.

Dr. Perkins replied that on operation there was no evidence of anything wrong. There was a seepage for a few weeks but neither the brain nor the dura seemed abnormal.

Dr. Johnson inquired what forms of meningitis might be expected in case of infections from the ear.

Dr. Berens inquired whether it might not be possible that these conditions were due to some autointoxication. It is not extremely rare to find cases, especially in children recovering from an extensive mastoid operation, which exhibit symptoms of toxemia referable to an intestinal condition, without there being any real meningitis or any abscess. The mere fact that Dr. Perkins did not find a large amount of cerebral fluid when he cut into the dura would suggest that he did not seem to be quite clear that there was any reason for the decompression. The result was undoubtedly perfect—the boy is well and healthy—but Dr. Perkins had not been quite clear in his statement as to why he did the operation. He himself had had a case in the Manhattan Eye, Ear and Throat Hospital four weeks ago where a very extensive mastoid operation on a child only eighteen months old was followed by similar conditions. They had all disappeared after a free movement of the bowels and the child was now attending the clinic for dressing of the mastoid wound.

Dr. Richards said that we occasionally see cases of complicated mastoiditis, in which the patient suddenly passes from a lucid condition to that of coma, possibly having had convulsions, or having shown the symptoms of intracranial pressure; an operation may be done which reveals no condition to account for this. There may have been aphasia, or an optic neuritis, or other head symptoms which suggested opening the brain and the investigation of it as the proper course to be pursued. We do this and find nothing, yet the patient returns to consciousness and eventually recovers as an uncomplicated case. We cannot say what takes place in these cases, and it is as Dr. Hoag had said, more or less speculative pathology.

DR. PERKINS said he thanked the members for the mild criticism he had received. As a matter of fact, the convulsions started at half past eight, and at first he thought they might be due to some intestinal trouble and would pass away, but as time went on and the patient remained comatose and was passing into a moribund condition, he did not feel justified in withholding what benefit operation might give. He had hoped to find something which would account for the symptoms but did not. It might be that the boy did have some intestinal intoxication, but it was difficult to decide that question. There was quite a brain hernia for some time—the brain bulged well up. Some cases have been reported in German literature where the symptoms were attributed to edema of the brain, which was relieved by operation. The cases are not rare in which after an operation of this kind all the symptoms clear up.

DR. JOHNSON said that what he had wished to learn was whether sufficient investigation of the spinal fluid had been made to determine whether there was any infection which might have come from the ear.

DR. PERKINS replied that a culture had been made of the spinal fluid, and the pathologist, Dr. Dixon, had reported three colonies of staphylococci, probably from contamination.

Report of Two Cases of Cerebellar Abscess With Thrombosis of the Lateral Sinus.*

BY D. S. DOUGHERTY, M. D.

DISCUSSION.

DR. BERENS said that the two cases presented were very interesting to him, the first one especially, because through Dr. Dougherty's courtesy he had seen a good deal of it. In both cases there was a tendency to perforation of the internal wall of the lateral sinus below the knee. The location had very little to do with it, but the fact that there was a tendency to perforation would indicate that the abscess in the brain was formed by contiguity, i. e., by direct infection internally. The point Dr. Dougherty had made about the counter drainage was most important. The case had evidently developed a side pocket of pus and the one cigarette drain was not sufficient to drain this; it was good surgery to make a counter drain through the occipital bone. That procedure probably saved the patient's life. The case was a very desperate one, and Dr. Dougherty had hardly done himself justice in his account of it.

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*See page 434.

Dr. Richards said that the method of handling the sinus illustrates in general a point in technic which it is well to follow. Dr. Dougherty had stated that in curetting the lower portion of the sinus he established a return flow, and that a few days later he took out the vein and found it infected. When a clot extends down to an inaccessible portion of the sinus, even though we can establish a return flow by curetting, it is best to take the vein out before we attempt this, for the reason that the infection as a rule travels further along the vessel walls than the clot extends, so that if we establish a return flow by curetting, in many cases we will have to take the vein out also at a later time, it being infected, and there will be the risk of sepsis from delay in taking it out.

Dr. Dougherty, referring to Dr. Beren's suggestion regarding infection from contiguity of tissue, said that he agreed with him thoroughly. The infection was at that direct point. Dr. Richards' criticism was absolutely correct, but he had stated that on account of the patient's condition—being in a state of absolute collapse—he thought it best to go no further. He had expected to resect the vein, but it seemed best to get the girl back to her room and not allow her to die on the table; had he resected the vein then there would have been no chance of saving her life. It just so happened that a faulty technic saved the patient's life, for if he had pursued the operation as he had intended she would certainly have died.

A Case of Mastoiditis With an Unusually Superficial Sinus.

Dr. Frank T. Hopkins. Some time since a patient with a chronic discharging ear came to the Eye and Ear Infirmary for treatment for furunculosis. She was there about two weeks and the furuncles improved, but did not disappear. During this time there was more or less tenderness over the mastoid, indicating involvement of the mastoid but the tenderness was not marked. The infection was a mixed one, and as the patient did not seem to be as sick as is usually found in a mastoid condition, investigation of the mastoid was delayed. After ten days, however, examination showed a streptococcus infection, and it was decided to operate. The first blow of the chisel opened directly into the sinus groove. During the operation he noted that as the chisel was struck, the bone instead of yielding in the usual way gave a cracking sound, as though a piece had been split off; and upon raising the bone the chisel was found to be resting directly on the sinus. The sinus, however, was not injured. The sinus was very far forward, and the middle fossa was very low and rested directly upon the sinus. A probe passed between the sinus and the middle fossa went into the middle ear; a backward curve gave a little cavity which might be called an antrum, lying beneath the sinus. These cases of very far forward sinuses are frequently met with, but one of such a superficial character, where the part above the sinus is not more than 1/16 of an inch thick, is not often seen. In going over some specimens at the Eye and Ear Infirmary, he found only one case in a long series. He presented a specimen from the pathologic museum of the infirmary to illustrate the case reported.

As he had already stated, he has been doing a little X-ray work in mastoid conditions, and had found it of assistance in determining the character of the mastoid by the skiagraphs. In this case it was established definitely that the sinus was very far forward, but this point was not so interesting as its extremely superficial position.

DISCUSSION.

Dr. Dougherty told of a similar case which was seen in his hospital service. He removed the cortex at the classical point for entering the antrum, and with the removal of the first fragment of the cortex he wondered what he was into; he soon found that he was in the sinus, and in order to enter the antrum he had to go behind the sinus and under it, working inward and upward.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Meeting of March 10, 1911.

Stereoscopic Radiographs of the Mastoid, Showing the Third Dimension.

Dr. Robert Cunningham Myles said that Dr. Cole had taken these radiographs for him with a view of finding out the relative condition of the mastoid, and they came out so much better than he had expected that he desired to present them with Dr. Cole's assistance in explaining some of the difficulties of the process by which the results were reached, and discussing the future of this method of attaining a diagnosis.

The method is not yet fully developed, but by it three dimensions can be observed. In regard to the external part of the head, in relativity, it promises many things. It may be possible to photograph a blood clot in this way. In one of these specimens presented half of the head is shown, leaving the side of the head photographed as though seen from the inside to the outside. Some of the frontal sinuses taken also show the relation, but they have not yet proved out as it was hoped they would—showing the relation of the ethmoidal and sphenoidal cells anteroposteriorly.

DISCUSSION.

Dr. Cole gave the credit for stereoscopic work to Dr. Caldwell, and stated that his work on frontal sinuses was classical; his own research work being more limited to soft tissues and abdominal cases. There is absolutely no doubt that lesions which are undiscernible in a single radiogram, may be seen in a stereoscopic pair of radiograms. Stereoscopic radiograms of the head are extremely difficult, because two plates of equal definition must be obtained, and it is hard enough to obtain one good plate without getting two in succession. The head must be held absolutely rigid while the plate and tube are moved.

The presentation of the reduced negatives, viewed with a hand stereoscope, Dr. Cole considers the best method for the general practitioner to examine stereoscopic plates. Roentgenologists, or persons familiar with the original plates, may use prisms for viewing the plates with very satisfactory results. There is also as much discussion among radiologists about the correct distance to move the tube, as there has been in the past about the correct distances that the lenses may be moved for ordinary stereoscopic photography. This point, and some others, are still to be decided.

Personally, Dr. Cole would have preferred not to show these plates until the technic has been perfected, but stated that perhaps Dr. Myles was wise to call attention to the field in which enough has been accomplished to give an idea of the aid promised in the future. If any of the men cared to pursue this work further, either Dr. Caldwell or himself would be glad to help with the method of showing the third dimension. At the present time this is the only hope of showing brain tumors. In the past, when we have obtained variations of density in a single plate, it was impossible to state whether it was a thickening or thinning of the skull or some area of increased density in the brain itself; stereoscopically this can be determined. Plates may be studied stereoscopically or pseudoscopically, one showing the outside of the skull and the other the inside. In all these plates, while both sides of the skull are taken, the part of the skull which is at a distance from the plate fails to show the detail which is shown in the parts near the plate, which accounts for our seeing only one side of the skull.

Dr. Cole asked for the assistance and cooperation of the members of the section in developing this method. Dr. Lang of Cincinnati, has shown that radiography is very valuable in the diagnosis of mastoid lesions and the otologists of Cincinnati are very enthusiastic about it. While Dr. Lang has done some stereographic work and has advocated it, it has not as yet become a routine practice, but Dr. Cole believes that lateral sinuses, ethmoid and sphenoid cells and the lateral views of the frontal sinuses will prove one of the greatest fields for stereoscopic radiography.

Dr. Myles said that what he had meant to say was that only half of the skull appeared,—the inside on one plate and the outside on the other plate. He had no claims to make in regard to the method, but was most anxious to see it developed, as it promised great aid in determining extreme pathologic conditions, blood clot, brain abscess, etc. It will require a great deal of study and hard work to perfect it, for it is still in an unsatisfactory stage, although the plates presented are very remarkable. Dr. Cole had explained the difficulty of holding the head absolutely still, etc. The plates must be taken from different angles with the head in exactly the same position.

A Case of Necrosis of the Internal Ear Which Existed but Was Not Evident at the Time of Radical Operation.

Dr. John McCoy. The patient, E. W., was seen by an ear specialist on September 17, 1909, and gave the following history:

German, age 32, married. His right ear had been discharging pus for several years. About two weeks before seeing the doctor he had contracted a cold, and following this had pain in the right middle ear and mastoid. The doctor kept him under observation for five or six days, and finally decided to do a Schwartz-Stacke operation, which was performed on Sept. 23rd. I was asked to be present at the operation, and witnessed a very complete and well done radical operation. There was pus and granulation in the middle ear and antrum, and softened bone down toward the mastoid tip. There was absolutely no evidence of extension to the internal ear.

The patient was put to bed after the operation, and on the third day his temperature and pulse were normal. For four days he did very well, but seven days after the operation, on September 29th, his temperature rose to 103°, and on the 30th the doctor asked me to see him. His temperature was 104° that afternoon, he had some photophobia, and was slightly apathetic. The conditions suggested commencing meningitis. His blood had been tested, and there was no bacteremia. His eyegrounds were examined, and the fundus of both eyes showed some hyperemia, but no actual inflammation. The doctor was asked if any tests had been made of the internal ear, but he said that the patient had complained of no symptoms referable to the internal ear, so that he had not thought of the internal ear. The turning test was tried, and his left ear responded and gave an after-nystagmus of thirty seconds;

the right ear responded very slightly, giving an after-nystagmus of five seconds. There was no spontaneous nystagmus. The caloric test on the left side was normal. The right did not respond to either heat or cold. The tuning fork was lateralized to the left side. With the Barany apparatus in the left ear he could not hear the loudest noise. That very strongly suggested internal ear involvement. The internal ear was opened that afternoon by Dr. McCoy, and, to the surprise of all, the cochlea was found to be a mass of stinking pus. The cochlea was curetted out. The infection must have been carried through the vessels. The temperature continued high, the patient became increasingly apathetic, and finally comatose, and died in six days of purulent meningitis.

The case teaches that if we are going to operate on a chronically suppurating ear, even though the patient does not mention any symptoms of the internal ear, it is well to test for them. These symptoms frequently have to be elicited. When the patient was asked if he had had any dizziness, he replied that he had had several slight attacks, but had attributed it to his stomach. On one occasion he had remained dizzy all day. The cochlear involvement is difficult to get at. If a patient becomes suddenly deaf, it would lead to suspicion of the cochlea, but in many cases where the infection is in the cochlea it is difficult to determine from the hearing tests how badly it is involved.

DISCUSSION.

Dr. Lederman recalled a case of internal ear involvement, though not bearing directly on the case presented by Dr. McCoy. The patient was a woman who had been shot in the ear, and three years later showed symptoms of internal ear irritation—deafness, dizziness, falling to the affected side. In that case the cause was still present—a bullet which had lodged in the middle ear, causing facial paralysis. The patient gave a history of suppuration and deafness in the ear from the time of the injury. It was impossible to see the membrane on account of a fibroma which protruded almost to the opening of the external auditory canal. When this was removed, the bullet was seen in position. It was removed later by a radical mastoid operation. A sort of bony capsule had formed around it, and it had been in place for three years. After the removal of the bullet the patient gradually improved.

When she applied for treatment the only symptoms complained of were vertigo, deafness and suppuration. The labyrinthine symptoms were the result of pressure, due to the foreign body imbedded in the external wall of the internal ear, at the site of the horizontal semicircular canal and facial aqueduct. Seventy grains of lead were saved from the bullet, though it had to be removed in pieces.

Dr. Kenefick said that before every radical operation it should be determined whether or not the internal ear was free from trouble.

Dr. Jordan said he had little to add to what had been said by the previous speakers. The case spoke for itself. It was generally conceded nowadays that the labyrinth should be tested before every radical operation, and that an existing labyrinth suppuration should be attacked at the time of the mastoid operation. Dr. Jordan then related a case which he had seen only a few hours before in consultation. A boy twelve years old suddenly developed meningeal symptoms three days ago. He had been perfectly well the day before, and the attack came out of an apparently clear sky. A year before this boy had had a fracture of the skull. A decompression operation had been done, and the boy had recovered quickly and completely. Now the same surgeon was called in again to investigate the old fracture. He reopened the old wound, exposed the dura and incised it and found everything perfectly normal. This excluded the old fracture as a causative factor. Then the ears were investigated, and it was found that the boy had had a chronic otorrhea of the left ear of long standing, and on the following day Dr. Jordan was called in to see the case. He found the boy in a stupor, with the symptoms of fully developed meningitis. A spinal puncture was done, turbid liquor was withdrawn, and found full of pneumococci. That excluded the epidemic form of meningitis. The ear showed a total defect of the membrane, with no obvious indication of any mastoid involvement, but intense swelling of the mucous membrane and profuse discharge. The labyrinth was tested with hot and cold (even ice) water; there was absolutely no caloric reaction. Hopeless as the case was, it was decided to open up the mastoid quickly in order to inspect the labyrinth wall and to search for a possible subdural abscess, the evacuation of which might check further meningeal infection. The mastoid was completely sclerosed, the antrum containing edematous mucous membrane. The dura of the middle and posterior fossæ was exposed. There was no extradural abscess, nor was there any apparent portal of entry in the labyrinth. Under the conditions it was decided to go no further and the wound was closed and dressed.

This case was in all probability one of an occult labyrinthitis which had suddenly led to an infection of the meninges, and which also showed the importance of the labyrinth test.

NOTE (added a week later)—The boy died after forty hours and no autopsy could be obtained, but a few days after his death his father was told by an eye-witness of an accident which had happened to the boy the day before his illness. He had fallen from the tailboard of a cart and struck on his head. He had been unconscious for a little while, but had recovered quickly and then went home without saying anything about it. His accident may have been the connecting link between the old suppuration in the labyrinth and the sudden meningeal attack.

DR. McCOY, in closing the discussion, said that he had nothing to add, excepting that he felt if the patient had had a coincident labyrinthine operation at the time of the radical his chances would have been much better, and he might have gotten well, for he went on for eight or nine days following the radical operation with a normal temperature, and then something broke through; whereas if the internal ear had been drained during those eight or nine days the probabilities are that he might have recovered.

DR. KENEFICK said that he had happened to be present at the time of Dr. McCoy's operation, and felt with him that if the labyrinth had been tested before operation the man's chances of recovery would have been greatly increased.

A Fatal Case of Hemorrhage Following a Peritonsillar Abscess—Bleeding From the Throat, Nose and Ear.

DR. LEWIS A. COFFIN. On the 15th of February, of this year, there was brought to my clinic, at the Manhattan Eye, Ear and Throat Hospital, from the Ear Department, a little girl 21 months of age, who had been brought to the hospital because on the day previous there had been two hemorrhages from the left ear, the first early in the day, and slight; the second, at 3 p. m., not profuse, but greater than the first. On examination the external ear was seen to be blood stained, there was a marked swelling below the angle of the jaw on the left side, and on examining the throat one saw the typical picture of a large peritonsillar abscess. The usual incision was made. Instead of pus there flowed from the incision a quantity of blood, such as one sees upon opening a hematoma. When the cavity was empty the flow ceased. There was no acute bleeding. The child could not be taken into the hospital, and I asked one of my assistants, Dr. McMurdy, to see her at her home. This was on Wednesday. During Thursday and Friday there was no bleeding, and the mother and sister, both unusually intelligent, tell me that she was playful and that they considered her quite well.

Saturday morning at about 6:30 the child asked her mother to take her from the crib to her arms. The mother answered that she hadn't the time, but would get her a glass of milk. As she started to do this, she heard something which caused her to turn again to the crib, where she saw her baby bleeding from ear, nose and mouth. She died almost immediately. The sequence of events from the child's first taking sick is as follows: On Tuesday, February 8th, she was seized with convulsions. A doctor was called and child was relieved after a mustard bath. Two days later a swelling was noticed below angle of jaw and child was very restless. An ointment was prescribed for the swelling. The throat was not examined. Three days later, or on Sunday, the child suddenly choked, whereupon the mother turned it head down and washed its mouth with glycerine and lemon. There was much "slime and phlegm" gotten rid of, and the child seemed relieved and better than for some days. On Tuesday, the day before coming to the hospital, the hemorrhages occurred from the ear, and subsequent events were as noted above. The child had met with no accident and there was no specific history.

Conclusions.—Not attempting to explain the convulsion, I should say that this child had developed a peritonsillar abscess complicated by an acute suppuration in the middle ear. On the Sunday morning when the child had a choking spell the peritonsillar abscess probably spontaneously ruptured and emptied, either in whole or in part. The ear may have ruptured at the same time, but be that as it may, the necrotic process went on until the wall of some artery gave way, probably the carotid, possibly anomalously placed. The previously filled pus cavity filled with blood, some of which found easy exit through the open drum membrane into the outer ear. At the time the child came to the hospital active bleeding was probably controlled by a clot formation, which held for two days after the opening of the hematomatous sack. I have been unable to make an exhaustive search of the literature. I do not recall having seen reported any case presenting the peculiar chain of symptoms which I have just recited. Cases have been reported in which death has been due to hemorrhage from the erosion of vessel walls during a peritonsillar suppuration. They all fall into the same class and point the same lesson, viz., early incision.

Flatau in reporting a case of sudden death from hemorrhage following a late incision of a peritonsillar abscess, points as a special danger the erosion of the arterial wall in cases too long treated by the expectant method. In the case just reported the very grave mistake was made of not even looking into the throat.

DISCUSSION.

Dr. Myles agreed with Dr. Coffin in regard to the pathology of the case, and thought that he had solved the manner in which it occurred. He himself had never had a case of fatal quinsy. The Index Medicus, he believes, refers to a number of these cases where the patients died from the effects of quinsy. He has had a few cases of peritonsillar injury coming from the removal of deep tonsillar adhesions, where the tonsil was adherent to the deeper tissues, and the blood vessels were ruptured, causing a hemorrhage which extended by extravasation from near the hyoid fossa to the eustachian tube, and it was two or three months before the bleeding entirely ceased. The tugging and traction on the tonsils seemed to tear some of the blood vessels beyond the field of operation.

Dr. McCoy said that some years ago Dr. Newcomb had reported thirty-five or forty fatal hemorrhages following quinsy, and that this was another case to be added to that series. While quinsy is generally regarded as a very slight malady, cases of this kind make one think of the possibilities in connection with it. Dr. Coffin's case was certainly a most interesting one, and he had never heard of one like it.

Dr. Jordan said that he had never seen or heard of a case exactly like the one reported by Dr. Coffin, and told of a case of quinsy in which there was no profuse hemorrhage from the incision, but an oozing which lasted for several days. He had to remain with the patient for several nights, and the bleeding was finally checked by continuous pressure. Nothing else seemed to have any effect. He had not been able to explain the case, although afterward it was found that the coagulation point of the blood was extremely high. The patient was an elderly gentleman with hardened blood vessels. Sometimes in these highly congested areas the bleeding is profuse and continues for a long time.

Dr. Leshure recalled a case presented at the Vanderbilt clinic, of a young colored woman. At first they could not tell whether or not the carotids had been injured, but the bleeding was profuse enough to cause anxiety. The pulsing could be seen very distinctly. It was just behind and internal to the tonsil, and might readily have been mistaken for a tonsillar hemorrhage. He had heard of another case recently in another town which had died. The patient had a very large peritonsillar abscess, and died in a few minutes. Whether the vessel was misplaced, or the knife inserted too deep, he did not know.

Dr. Coffin, referring to what Dr. Jordan had said about the possibility of the hemorrhage being from the incision or from the knife having struck the artery, said that in this case there was no hemorrhage following the incision for sixty hours, and that he was sorry that the question of hemorrhage from incision had come into the discussion, as by having our attention on that point we were liable to lose the lesson taught by the case just reported, namely, there is great danger in delaying incision, as when the pus is pent up there is danger of erosion of some of the greater blood vessels.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Meeting of May 12th, 1911.

Paper: A Preliminary Report on Some Two Years' Experience in Modified Blood Clot Surgery of the Mastoid Region, With Presentation of Cases.*

By Hugh B. Blackwell, M. D.

DISCUSSION.

Dr. Chambers said that for a good many years he had been operating very similarly, although he has not called it modified blood clot. It is a very valuable way of getting quick results. In the first place, the skin and lobe of the ear are washed just before operating and painted with tincture of iodine. After being sure that the canal of the ear is clean, the regular incision is made, and, if necessary, a cross incision also. The antrum is sought out and, only if required, curetting along the iter to the ossicles is done. He has never, however, had the nerve to take out the whole of the posterior ridge; a portion of that, at least, is generally left. It has been many years since he has had any resultant facial paralysis, such as occasionally occurred in the early years of his practice. After the mastoid is cleaned out, if there is any subdural abscess or sinus thrombosis, that is taken care of. The packing is put in through the auditory canal, pushing the first end of gauze to the tympanic ring and middle ear floor, so that when it is pulled out it leaves the canal a straight line as in nature.

He closes up the posterior wound with a single subcutaneous stitch, regardless of much or little bleeding. In case there has been much necrosis of soft parts, he allows a second piece of gauze to escape from the lower end of the wound. This gauze is removed in from one to several days. There is none of the depression Dr. Blackwell speaks of in the old-fashioned wound. Of course there is some depression if the mastoid exenteration has been very large.

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*See page 450.

He recalled half a dozen cases, the last one being complicated with a subdural abscess in a three-months-old child. At the end of a week the dressing was changed. At the second dressing the mother wanted to nurse the child and took it out of the hospital, and it has not been seen since. It was all right. Seventeen days seemed a long time for an average, if the mastoid wound is thoroughly cleaned out at operation.

Dr. Lederman inquired whether Dr. Blackwell makes it a rule to take off the posterior wall in all cases, and, further, if there is considerable suppuration, whether he syringes out the cavity, or mops it dry.

Dr. Rae congratulated Dr. Blackwell on the excellent results of his cases. He thought, however, that the name was misleading. The term "blood-clot" should be restricted exclusively to those cases in which the operative cavity was allowed to fill with blood and in which the postauricular wound was completely sutured. Healing by "blood-clot" did not seem at all compatible with the insertion of a drain. In the method described by Dr. Blackwell it rather appeared that the time of healing was hastened by lowering the posterior wall, by almost completely suturing the wound and in this way reducing the size of the operative cavity to a minimum. These cases should be carefully observed to note the later occurrence of secondary infections.

Dr. Hays agreed with Dr. Rae about the name of the operation. A short time ago he himself had showed a number of cases which he had called "primary suture of the mastoid wound," without saying what was taking place underneath. Long before he started in with this series at the Infirmary he had seen many of the blood clot operations, many of them being failures, and, being interested in the subject, he read it up very thoroughly, and found many criticisms on the operation, and was led to believe that the failures were due to the excessive amount of antiseptics used to clean the cavity. If all of the infected tissue is removed and the cavity washed out with a 1-5000 bichlorid of mercury or absolute alcohol, there will be a wall of deadened tissue formed between the blood clot and the tissue beneath, acting like a foreign body. It would seem to be not the question of the blood clot that forms, for a blood clot would be a very good area for microorganisms to form on, but it is really a fibrous cavity, which has been made as close as possible by filling it. The narrowing of the cavity is of a great deal of importance. He has seen cases which for a week or two had considerable pussy discharge, but this usually ceases in two or three weeks. It is a question whether it is better to sew up these wounds, or if it is not just as well to put in a light packing, and wait until the first dressing and then close the wound. He had seen three cases this winter of Bezold's abscess and perisinus abscess, where he left in a small packing until the first dressing, and then brought the wound together with adhesive plaster, and they healed very satisfactorily. Instead of the saline dressing he uses a glycerin dressing, which has a hygroscopic effect. The last case he operated upon there was a subperiosteal abscess. As the tissues are in a pathologic condition a primary closure of the wound will not hold. The tissues are considerably thicker and are inclined to slough, and it would seem to be better to leave the closure of the wound until the second or third day.

Dr. Bryant expressed his regret at not having arrived in time to hear Dr. Blackwell's paper. He said that he had seen many of the cases presented and that he wished to compliment Dr. Blackwell on the excellent results obtained. He quite agreed with Dr. Hays about the deleterious effect of using antiseptics in the wound. A cause of failure in getting primary union of the mastoid wound lies in the incomplete operation—leaving infected material behind. Another source of failure is the meddlesome treatment which the wounds often receive. A very important factor for success is to have the wounds as aseptic as they can be made by the use of the most rigid surgical technic, for it is much more difficult to convert a septic wound into an aseptic one than it is to keep an aseptic one aseptic. The bacteria added to a septic wound during the operation appear to be more important than the few original bacteria remaining in the wound after a complete operation.

Dr. Hurd suggested that if in cases where there was some discharge after the operation Dr. Blackwell would use a Bier suction cup, he would not only get out more pus, but would also increase the vascular supply. It is simply a hard rubber bulb with strong suction, and if placed in the posterior opening would draw out all the pus.

Dr. Kerrison said that he had been much interested in this kind of work and regretted that he had not heard Dr. Blackwell's paper. He could not himself report any series of such operations, but had had a certain number of cases of mastoiditis operated upon in which after the middle ear had recovered its normal condition the formation of granulations in the mastoid wound had been slow. He had, perhaps, a half dozen of such cases in which as a secondary operation he had sewed the wound up, and usually with primary healing. Dr. Kerrison agreed with Dr. Rae that such operations should not be called a "blood clot" operation, and probably never so when even the smallest drain was used.

Dr. Rae had asked what percentage came back for secondary operation. Even if such percentage is large, it should not militate against this method so long as in the majority of the cases a decided hastening of the final healing is secured. Dr. Reik, of Baltimore, who still calls his operation a "blood clot" operation, and still sews up the whole wound, claimed in a recent discussion of this method only about 75 per cent of perfect primary unions. So long as he accomplishes this result, the benefit to his patients in the aggregate is obvious.

Dr. Blackwell, replying to Dr. Lederman's question about the posterior wall, said that he took down the posterior wall in every case, almost to the antrum. The canal does not close if it is kept packed. If that is neglected at a single dressing it may partially collapse. It must be packed at every dressing. As for the washing out of the wound, when the discharge is profuse, he had never found it necessary.

Dr. Rae had criticised the name of the operation. It does not seem quite appropriate to call a wound of this sort an unpacked cavity reduced in size. Most of these cavities were very large at the conclusion of the operation. Eight of the cases were perisinus abscesses occurring in adults, and the wounds were really enormous. The only packing was a little strip at the extreme anterior portion of the wound, and it was then allowed to fill with blood. Of course the cavities were reduced in size, owing to the pulling in of the soft parts, but these cavities were certainly filled up by the clot of blood.

He had not observed any secondaries in the series he had performed.

Referring to Dr. Hays' remarks: The cases are not sealed up. All the sutures are taken out in twenty-four hours, and the wound is kept open in the most dependent portion until all discharge ceases. There is no tension. Very slight tension would cause the wound to open. Of course, in the old blood clot method, where it is not kept sealed, it was different, but where it is not kept sealed the surgeon certainly knows what is going on.

Dr. Hurd's suggestion in regard to the use of Bier suction seemed an excellent one, and he intended to try it. Dr. Kerrison was correct in what he said about dyscrasias. Such conditions form a contraindication to the operation.

A Case of Chronic Attic Suppuration Cured by the Administration of an Autogenous Vaccine.

Dr. Gerhard H. Cocks. The patient, a man 20 years of age, came to Dr. McKernon's clinic almost a year ago with the following history: During an attack of measles in childhood the right ear discharged for a couple of days. Since that time until two years ago his ear gave him no trouble. Two years ago he began to suffer from hardness of hearing, right side. He consulted a physician, who performed some operation through the canal, presumably the removal of a polyp. Since then he has suffered from a purulent discharge with a bad odor, but never profuse. He has also been subject to headaches, often limited to the right half of the head, and vertigo.

On examination, a small perforation was found in Shrapnell's membrane, just above the short process. A drop of pus could be wiped away from this perforation, especially if the patient performed autoinflation. As he was unwilling to consent to any operative procedure, he was treated for eight months in the clinic by the instillation of alcohol, bichlorid drops and catheterization, but with no improvement.

On February 18th, about three months ago, I obtained a culture of the pus coming through the perforation, and Dr. Callison found pneumococcus in pure culture. An autogenous vaccine was made and administered by Dr. Callison twice a week, as follows:

February	21	400	million
"	24	"	"
"	28	"	"
March	7	"	"

March	10	500	million
“	14	500	“
“	17	700	“
“	21	800	“
“	24	600	“
“	28	800	“
April	4	800	“

On March 21st, after eight biweekly injections, the ear became dry and the perforation closed.

The injections were continued about two weeks after the cessation of the discharge to insure a permanent cure.

Our treatment has cured the purulent discharge, headaches and vertigo for a period of practically two months.

The case is shown because one would naturally have supposed, unless vaccine treatment had been given a trial, that conservative measures were contraindicated because of the location of the perforation (in Shrapnell's membrane), which is supposed to denote disease of the ossicles in chronic cases.

DISCUSSION.

Dr. Chambers inquired whether any of the members were using enzymol for pneumococcus pus. He has used it for many years and has found it very valuable. It has sometimes stopped discharges containing other microorganisms, but always the pneumococcal. This is the first case he has seen where O. M. P. with a small perforation in Shrapnell's membrane had come to rest so successfully.

Dr. Carter inquired whether it was purely a pneumococcus infection, or whether the pure culture of this organism mentioned by the doctor had been obtained by differentiation. The question as to whether there were also present streptococci and staphylococci would have considerable bearing upon the treatment by vaccines. Pure cultures of any germ are seldom found in suppurative conditions of long standing.

Dr. Hays said that he had used enzymol on two or three cases recently, but the discharge seemed to be aggravated instead of lessened, and as they were private cases he discontinued its use.

Dr. Cocks said that the culture obtained showed a pure pneumococcus infection, not a mixed infection.

Paper: Dental Lesions as Etiologic Factors in Otalgia and Tinnitus.

By M. I. Schamberg, D. D. S., M. D.

DISCUSSION.

Dr. Charles E. Atwood said that he had been much interested in the paper presented by Dr. Schamberg, and appreciated the honor of a request to discuss it from a neurologic point of view. It seemed at first that a definite explanation had been found for all otalgia and tinnitus. The essayist had certainly demonstrated the very great importance of a careful examination of the oral cavity in these conditions. A minor criticism might be made of the use of the term "reflex pain." The term usually employed by neurologists, viz., "referred pain," would seem to be better. The connections of the sensory nerves of the face, on careful dissection, are found to be very intimate. Referred pains, as regards the viscera of the body, have been studied very carefully by Head, who has made a chart of the intermedullary segmentation, based on the location of hypersensitive areas which have resulted from visceral irritation. Apparently the only explanation of referred pains, in the case of the viscera of the body, is that the impulses are carried by the sympathetic nerves from the irritated viscera to the spinal cord, and then reflected over the sensory roots outward from the segment of the cord at which the irritation is admitted to the areas of distribution of these sensory roots, rather than to the viscera from which the impulses come. In the case of the referred pains of the ear, may there not be some similar explanation? All are familiar with the necessity of examination of the teeth in cases of facial neuralgia, but extraction has often been carried to an excess. Since the use of the X-ray we have been able to be more definite in our work, and have been able to discover conditions to which the writer of the paper referred.

Reference had been made to a western writer who claimed that dementia præcox was frequently caused by impacted teeth. That question is debatable. It is now realized that for the development of such a disease as dementia præcox there must be a constitutional or mental make-up which goes with the disease; and if this does not exist, no sort of irritation, such as neuralgia from impacted teeth, could produce the condition. Is it not possible that in some of the dental conditions mentioned an infective neuritis takes place which might explain the continuation of the pain after the withdrawing of the tooth and the treatment of the cavity?

The doctor said that he does not see many cases of otalgia in the nervous department of the Vanderbilt Clinic. They probably go mostly to the otologists. A paper of the kind presented demonstrates the value of team work by the various specialists in studying the etiology of disease.

Dr. Bryant stated that he had seen a great many cases of ear pain. In a few of them he could find no irregularities of the throat, nose or ear to account for the pain. According to his recollection, in all these cases the source of pain had been located by dentists in the teeth, and had been relieved by proper treatment. He had discussed the matter of otalgia with Dr. J. Ramsey Hunt, who considers it due in some cases to disease of the geniculate ganglion; but Dr. Bryant is inclined to attribute cases of otalgia of obscure origin to dental defect.

Dr. Lederman said that the paper recalled to mind a case which he has had under observation for some time, in which he had not as yet been able to localize the cause of the trouble. There is a possibility that it may be of dental origin. The X-ray is a valuable aid in such cases, where no organic cause can be discovered. In all such cases it is most important to have an X-ray plate made.

Dr. Henry C. Ferris said that he wished to present his tribute of appreciation of the beautiful demonstration of radiography that had been made. He could not disagree with anything that the essayist had said, but would report a case of septic infection which was referred to the mastoid and operated upon. During his convalescence the patient came to his office, and upon examining his teeth he discovered that the lower left bicuspid was discolored with no carious cavity. Upon opening the tooth and liberating the putrefactive gases, the man gave a cry of pain, and put his hand to his ear; upon being asked if his head had been touched, he said no, but that he had a severe pain in his mastoid. The doctor said that he introduced a solution of formaldehyde into the tooth and sealed up the cavity hermetically, and told the patient to return if he had any further disturbance. He returned at five o'clock in the morning, saying he had had a very uncomfortable night, and that the pain was all in the ear. The tooth was opened, and on liberating the gas the pain in the mastoid ceased. This was reported to the otologist. The next week the patient complained of pain, on the other side of the head, of a similar nature, and examination with the X-ray showed two molars in a septic condition, which were opened and sterilized, and the referred pain in the right mastoid disappeared.

As correspondent of the New York State Dental Society, Dr. Ferris communicated with eighty neurologists and alienists for their opinion in reference to brain disturbances from impacted teeth, and the responses were very interesting, but inconclusive. One-third of the replies were in the affirmative, one-third negative and one-third on the fence; so that this investigation in the neurologic field demonstrated very little consideration or appreciation of dental lesions by the neurologists —at least not sufficient to form any definite conclusions upon which to base a diagnosis.

An important point upon which Dr. Schamberg had not touched was the prevention of the impacted wisdom teeth, which he states occurs so frequently. The preservation of the full set of deciduous teeth and the prevention of improper pressure of the muscle mask of the face would prevent the impaction of a large percentage of these wisdom teeth. The force exerted upon the erupting teeth by the whole muscle mask of the face produces a distal position of the whole arch to the skull as an entirety, and the result is that when the time comes for the eruption of the third molar there is no room between the distal side of the twelve-year molar and the ascending ramus of the mandible, and it becomes impacted.

Dr. Kerrison said that the paper was most instructive to otologists, as showing that a routine examination of the teeth should be made in all cases where pain is complained of that cannot otherwise be accounted for. Probably we often look for dental defects and throw out this cause of trouble because there is no gross defect which the aurist can detect. The essayist had shown very clearly that many serious dental lesions would be quite beyond diagnosis by the physician.

Dr. Schamberg said that he hoped that he had not given the impression that he ascribed to the mouth the etiology of all the pains about the ear. He had merely wished to emphasize the fact that a large number of cases about the face suffer from these referred pains, and it is highly probable that in a large proportion of these cases we may find coincident lesions in the mouth and ear. He has seen a number of cases where patients have had pain in the ear which he believed to be due to mouth lesions, and afterward found that they were under the care of otologists who were treating definite troubles in the ear that were responsible for the pain.

ABSTRACTS FROM CURRENT LITERATURE.

I.—EAR.

Concerning the Permeability of the Tympanic Membrane.

STEINSCHNEIDER (*Monats. für Ohrenheilkunde und Laryngo-Rhinologie,* Vol. XLIV, 1910, p. 461) has made a series of experiments both on man and animals to determine whether medication applied to the external canal can have any influence on the middle ear. He found it impossible to get iodine to pass through the membrane in sufficient quantities to be found in the urine. Also on the cadaver he obtained negative results with iodine. The experimentation on animals, however, showed that while Berlin blue and acid fuchsin gave negative results, he was able to get a carmin solution to penetrate through the drum and stain the mucous membrane of the tympanic cavity. He says there is no doubt but that small quantities of carmin solution placed in the external auditory canal will penetrate the intact drum and reach the mucous membrane of the tympanic cavity. *Horn.*

The Determination of the Upper Hearing Limit Both for Air and Bone Conduction.

STRUYCKEN (*Beiträge zur Anatomie, Physiologic, Pathologie, etc.,* Vol. III, 1910, p. 406) has modified the monochord of Savart so that it becomes a useful instrument in the measuring of the upper tone limit. The instrument consists essentially of a steel wire, which is drawn tight over a properly constructed metal frame on which a scale is marked. An adjustable clamp slides around the framework and binds the wire so that various lengths of wire may be brought into vibration. The instrument is constructed with a handle so that it can be easily grasped with the left hand, and the end of it so made that it may be placed against the mastoid process or other bony prominence in order to determine the amount of bone conduction. The wire of the instrument should not be over 50 cm. long and tuned so that 40 cm. will give 6,280 vibrations per second; 25 cm. would then give 10,070 vibrations; 20 cm. would give about 12,500 vibrations; 15 cm. about

16,600 vibrations, and 10 cm. about 25,000. The wire is most accurately set in vibration by a small felt rod moistened with benzol or turpentine. *Horn.*

The Relation of Otitic Meningitis to Cholesteatoma of the Ear.

DANELON (*Monats. für Ohrenheilkunde und Laryngo-Rhinologie,* Vol. XLIV. 1910, p. 760) has studied during the year 1908-1909 36 cases of meningitis; 14 of these followed acute purulent otitis media, 10 followed chronic purulent otitis media, and 12 cholesteatoma. From this study he says that it is important to distinguish between suppurative leptomeningitis when due to an acute suppuration or to a chronic one or to one complicated with cholesteatoma. In acute otitis the leptomeningitis is almost always a direct result of the suppuration. In cholesteatoma the meningitis is almost always secondary, following other intracranial complications, such as sinus thrombosis, brain abscess, etc. The simple chronic suppurative process occupies a middle position. The practical application of this fact is that given a case of meningitis in which one has found cholesteatoma, it is important that during the operation the surgeon must seek for some complication, carefully examining the wall of the sinus, and to broadly lay bare the dura of both cerebral fossæ, provided that the possibility of infection passing through the labyrinth has been excluded by a previous careful test of the function of the labyrinth. *Horn.*

The Relation Between the Vestibular Apparatus and the Cerebellum.

BARANY, Vienna (*Monatschrift für Ohrenheilkunde,* Vol. XLIV. Heft 5). As late as 1907 Barany had no idea of the relation between the vestibular apparatus and the cerebellum. At that time he believed that the cerebellum was the center for equilibrium, and that the reflex phenomena, which arose from the vestibular apparatus, were fully explained through their well-known connection with the vestibular nerve. For example: By irritating the vestibular apparatus with cold water, a nystagmus of the eyes followed. The irritation starting in the semicircular canals, traveled through the vestibular ganglion in the internal auditory meatus to the vestibular nerve centers in the medulla oblongata, where they lie in close connection to Deiter's area, situated at the junction of the medulla and cerebellum. From this center the impulses pass, by way of the posterior longitudinal bundles, to the oculomotor and abducens center, and in this way bring about the characteristic eye nystagmus. Other impulses are sent downward by way of Deiter's nucleus and the vestibular-spinal bundle to the anterior horns of spinal cord and bring about disturbances of equilibrium. In this way the cerebellum itself had no hand in the process. About this time the work of Marburg and Bing appeared, on the experimental destruction of the lateral cerebellar bundles (Kleinhirn-Seitenstrangbahnen) with the accompanying atactic phenomena.

In order to understand the significance of this it is necessary to recall the well known relation between eye nystagmus and falling. If in a normal individual a rotary nystagmus to the left is produced, the patient falls to the right. If the head is bent 90° to the left the patient falls forward. If 90° to the right the patient falls backward.

In its final analysis this phenomenon cannot be explained by the changed position of the semicircular canals, but by the sensibility of the muscles and joints of the neck and head, the so-called "proprioceptive sensibility of Sherrington's." This sensation must meet at some point in the brain, the irritation arising from the vestibular apparatus, and the change in the innervation of the body musculature be brought about by the change in the innervation of the musculature of the head.

About this time certain peculiar phenomena connected with cerebellar ataxia were recalled which previously had no explanation. Most diseases of the cerebellum are accompanied by nystagmus. The difference between this nystagmus and vestibular nystagmus lies in the fact that vestibular nystagmus is always accompanied by falling in a certain definite way, as explained above, while the nystagmus of cerebellar disease bears no such relation. In addition, the turning of the head, at given angles, has, in the latter case, also no effect on the direction of the fall. A case of tumor of the cerebellum was now referred to Barany, where the patient would always fall spontaneously backwards and to the right. Cold water irrigation of the right ear brought about typical vestibular nystagmus to the left. The left ear also reacted normally to nystagmus as well as falling. If the head was bent to the right the patient fell forward, but when the same experiment was tried on the right side there was no change in the direction of the fall. In this way he was able to diagnose a right-sided cerebellar tumor, which was later confirmed by the autopsy.

A second case from v. Eiselberg's Clinic was presented, where there was great doubt as to the situation of the tumor. Typical caloric nystagmus could be demonstrated on both sides, but no influence on the direction of the fall could be shown either right or left. On account of the preponderance of symptoms on the left, the diagnosis was so made. The operation showed a tumor instead on the right side.

Cajal demonstrates in the recent (1911) edition of his book that the roots of the vestibular nerve end in the cortex of the cerebellum and on the way to the cortex of the vermis send out a number of collateral branches to the cerebellar hemispheres. Bolk, in his book, maintains that the hemispheres of the cerebellum have something to do with the innervation of the extremities. Barany himself noted that an ataxia of the same side was a regular accompaniment of abscesses of the cerebellum and also tumors of the cerebellar pontine angle.

These points led Barany to combine Grafe's touching experiment with the nystagmus test in normal individuals. (This experiment consists in allowing the patient to touch the finger of the examiner with his outstretched hand while his eyes are closed. The hand is then withdrawn and the patient is again ordered to find the finger, with his eyes still closed.) It was found that when the nystagmus was to the left the patient invariably pointed to the right. The theoretic conclusion was obvious. If in diseases of the vermis spontaneous falling took place, so in diseases of the hemispheres spontaneous mistakes in pointing must also take place. Later Barany had an opportunity to prove these theoretic conclusions in many cases of tumors and abscesses of the cerebellum which were referred to him for diagnosis. He concludes therefore that we are on the verge of very important discoveries in the diagnosis of tumors of the cerebellum, and a study of the original paper, which is very rich in details, would repay anyone interested in this subject. *Horn.*

II.—NOSE.

Oral or Nasal Route for Operating on the Septum.

HALLE (*Monat. für Ohrenheilkunde und Laryngo-Rhinologie,* Vol. XLIV, 1910, p. 826) in this article considers the question as to the relative value of the oral and nasal method of operating on the septum of the nose. He describes the three methods of operating on the septum through the mouth, in all of which the upper lip is carefully raised with the periosteum from the bony surface and turned up over the face. In the first method after elevating the lip, the periosteum and the mucous membrane are loosened from the lateral nasal wall and the floor and finally from the septum. If the septum is first attacked the mucous membrane over the cartilage is very easily torn. After the cartilage and bone are sufficiently bared the deformed portion is removed. In the second method the mucous membrane of the nose is cut and torn through at the pyriform aperture, the lip well elevated over the tip of the nose and the elevation of the mucous membrane of the nose and removal of the cartilaginous septum as in the former method.

LÖWE (Ibid., p. 1105) says that the incision through the lip should not be horizontal, but longitudinal. After proper cocainization, the lip is drawn upwards over the tip of the nose and the cut made directly in the median line from almost the edge of the lip downward through mucosa and muscle. The edges of the wound are held apart with automatic retractors similar to those used in the mastoid operation. The elevation of the mucous membrane of the nose should always start with that covering the floor and side of the nose, and later that of the septum. The submucous resection of the septum can then be carried out either according to Killian's or Freer's method.

Horn.

Indications for the Radical Operative Procedure in the Diseases of the Nose.

LÖWE (*Monat. für Ohrenheilkunde und Laryngo-Rhinologie,* Vol. XLIV, 1910, p. 1101) gives as indications for the radical operation on the nose the following conditions:

1. Tumors, either malignant or of such a character that by rapid growth they press on the neighboring structures, or, when not entirely removed, tend to recur.

2. All diseases of the accessory sinuses which have involved either the orbit, the cerebral fossa or the pterygomaxillary fossa. However, in certain cases where the indications of involvement are not very severe, the lesser operative procedures will be sufficient; but if, after the endonasal operations there is a return of the symptoms, the more radical procedure is indicated.

3. All chronic empyemas of the accessory sinus which are accompanied with multiple polyps, whose places of attachment are within the sinus cavities. The radical operation is indicated in these cases because it is probable that the interior of the cavity contains numerous other polyps which can only be removed when the cavity is completely opened up.

4. All empyemas of the ethmoidal cells in which the sagittal X-ray picture shows pus in the cells lying in the supra- and infraorbital plates, in which place it is not possible to reach the pus by the endonasal route.

5. In those cases of chronic empyema of the frontal sinus in which the X-ray picture shows that the endonasal operation has not succeeded in removing the pus from some of the extensions of the sinus.

6. All simple or complicated empyemas of the accessory sinuses in which the endonasal treatment has failed to bring about a cure, and in which there develops severe symptoms, such as high fever, severe pain, etc.

7. All cases of suppurative otitis, osteomyelitis and periostitis of the upper jaw which cannot be reached from the nasal openings.

8. All severe and extensive traumatic and ulcerative destructions of the interior of the nose.

9. All foreign bodies which cannot be removed through the normal passages, or which may be productive of harm should they be left in place. *Horn.*

Concerning Septum Operations in Children.

Rèthi (*Wiener medicinische Wochenschrift*, November 19, 1910). Every malformation of the nasal septum does not necessitate an operation. Only such deformities, particularly those well anterior, causing difficulty in breathing, speech defects, nervous disturbances or interference with the proper treatment of diseases of the accessory sinuses, should be operated on. In other cases the nose should be left alone.

Physicians are frequently misled in regard to the importance of deviations of the septum, particularly when a hypertrophic rhinitis exists at the same time. In such cases the septum operation will not be a success, because the hypertrophic condition and not the deviation was causing the obstruction.

The submucous resection operation, particularly in young people, frequently leaves a septum that moves about during respiration and causes the patient more distress than the original deformity.

In three cases the author has had to produce a perforation through this part of the septum. Contrary to the opinion of some writers, the author does not believe that a large septal perforation does any harm, in fact, in cases such as before mentioned, in which the submucous removal of a considerable part of the septum left a freely movable septum, the artificially produced hole through the septum is much to be preferred to the other condition.

The author believes that operations on the nasal septum in children should only be undertaken after the greatest deliberation and performed with great care. The author has seen seven cases in which the operation for deviated septum was performed in children between the seventh and twelfth years. The operations had been correctly performed by competent men. In three of the cases the child's breathing was not particularly relieved after the operation, especially at night, first one side and then the other being stopped up, and a history of these three cases discloses the fact that the nose in neither of the cases was particularly stopped up before the operation; that is, the obstruction was not constant.

The conclusion must be drawn that in these cases, too, the difficult breathing had been caused rather by a swelling of the mucous membrane than by the deviation. Some time after the operation, in all seven cases, there was a slight sinking in of the nose, in two cases quite marked. In one of the cases, after several months, the deformity slightly increased. This did not happen in any of the others.

The author years ago recommended a method for the correction of deviations of the septum which consisted in making a crucial incision through the septum. The author has operated on many cases of deviated septum in children by this method, and has never seen a sinking in of the nose afterwards.

In conclusion the author states that in children it is important, if radical operations have to be performed on the nasal septum, to put them off as long as possible, and when the operation is performed, to preserve so far as possible the bony portion of the septum.

If the submucous operation has to be performed, it will be well for the operator to get on if possible by removing very little of the septum. *Theisen.*

III.—PHARYNX.

The Tonsillectomy Question.

RÈTHI (*Wiener med. Wochenschr.*, No. 28, 1910) admits that there are cases where a tonsillectomy is indicated, where after repeated partial removals or slitting the tonsil the patient is not benefited, or where acute rheumatism or acute sepsis can be traced to the tonsil. The operation must only be done where very strong indications are present. Although the author has never seen an unfavorable result where a partial removal was done, in two cases where the complete operation was carried out a complete destruction of the singing voice occurred. He explains these unfortunate results as the result of disturbing scars. *Horn.*

Contributions to the Study of Ludwig's Angina.

DELIE (*Revue Hebdom. de Laryngol.*, No. 29, 1910) in speaking of the treatment states that it can only be surgical. It is best to open the abscess from the floor of the mouth when possible. If it cannot be opened in this way it must be reached from without, either by a lateral or median incision above the hyoid bone. The median incision is best, because no important structure can be wounded. The hypoglossal nerve may be injured, but this does not do any special harm.

The author gives the following characteristic points:

1. Rapid swelling of the sublingual fold.
2. Board-like swelling of the floor of the mouth, no fluctuation being apparent.
3. Absence of discoloration of the skin of the neck in the early stages.
4. General septic condition.

The author reports two cases in both of which the abscess was reached by the external incision. *Theisen.*

IV.—LARYNX.

Fatal Case of Superior Bronchoscopy.

Chiari (*Monats. f. Ohrenheilk. und Laryn.-Rhino.*, Vol. XLIV, 1910, p. 877) reports a case of a boy, seven years old, in which upper bronchoscopy was done, with fatal results.

The child had inspired a kernel of corn, which, according to the X-ray, had located at about the left main bronchus. A portion of the kernel had been removed, when the child suddenly became cyanotic, and respiration and pulse ceased. At the postmortem the chief bronchus on the left side was blocked by a corn kernel, and the smaller bronchi filled with pus.

The author believed that the fatal result was due to the impaction of the kernel in the left bronchus, although it is possible that the case is a chloroform death, as that drug was used for the anesthesia. *Horn.*

The Use of Trichloracetic Acid in the Treatment of Tuberculosis of the Larynx.

Sytschow (*Zeitschrift f. Laryngologie, etc.*, Band 3, p. 487). In a series of 25 cases the author has had some very favorable cases and considers this substance as far superior to lactic acid or any other of the caustic agents generally employed. He applies the pure crystal, without fusing it on the sound, and allows it to act as deeply as it will. If necessary a second crystal can be applied at the same sitting. He noted a complete disappearance of the dysphagia in 15 cases directly after the first application, and only one case in the remaining series needed as many as six applications. Ulcerations, some of them very extensive, began to clear up after the second and third cauterization. The cough and aphonia was much improved in several cases. He also had occasion to use the acid in various tuberculous processes in the mouth with most satisfactory results. *Horn.*

Bronchoscopy for Foreign Bodies, With Remarks Concerning Bronchial Asthma.

Schrötter (*Wiener medicinische Wochenschrift*, Nos. 3 and 4, 1911) reports the interesting case of the aspiration of a tooth plate containing one tooth and with the following dimensions, 13 mm. long, 11 mm. wide; height of the tooth, 10.4 mm.; greatest width, 7.4 mm.

The extraction of the foreign body, which was accomplished under cocain anesthesia, with the patient in the sitting position, was unusually difficult.

The tooth was in the left bronchus, and with a bronchoscope 30 cm. long it was possible to get only within ½ cm. of the foreign body.

The operation, lasting about 18 minutes, was not followed by any reaction. The left-sided bronchopneumonia promptly cleared up, so that the patient could leave the hospital within a few days.

The writer emphasizes the point that an X-ray plate does not always show whether the foreign body is in the right or left lung.

It is important to get the radiograph during inspiration and a forced cessation of respiration.

Another point brought out in the writer's paper is the negative findings with percussion and auscultation. This is caused by the well marked bronchitis, usually bilateral, caused by the presence of the foreign body. The dyspnea is not entirely caused by a shutting off of a portion of the lung, but is also the result of the changes in the bronchial tubes. The author believes that an aspirated foreign body causes reflexly by irritation of vagus branches, an increased innervation and tone of the bronchial musculature accompanied by symptoms of a capillary bronchitis. This irritation of the bronchial musculature after aspiration of a foreign body may persist for a long time and may cause a sensitiveness of the mucosa of both lungs, a spastic condition persisting for months. The writer has before mentioned the good results following bronchoscopy in cases of bronchial asthma by the use of cocain or cocain adrenalin. Nowotmy and Galebsky have made similar observations. Ephraim's observations of the treatment of bronchial asthma by local applications of cocain or similarly acting substances are also quoted.

His results show that by this method of treatment attacks of bronchial asthma are not only directly benefited, but may remain away for a long period of time. *Theisen.*

V.—MISCELLANEOUS.

Discussion on the Latent Infections by the Diphtheria Bacillus and Administrative Measures Required for Dealing With Contacts.

R. M. Buchanan (*British Journal of Laryngology,* February, 1910). Latent infection may be regarded from a bacteriologic standpoint as the presence of an infective agent unaccompanied by any obvious pathologic change.

The identification of diphtheria bacilli in routine diagnostic work may be stated to depend upon the morphologic character of the organism. The great variety of forms presented by the diphtheria bacillus in cultures from the throat has led to repeated attempts to arrange these forms in definite classes or types. Cylindrical or cuneate forms are the two chief types; others are frequently seen in the same culture.

Culture tests are necessary to confirm the morphologic tests. The virulence of the diphtheria bacillus in apparently healthy subjects, whether designated contacts or carriers, is only slightly less than the virulence of the organism in patients. Observers are agreed that the bacilli disappear in the great majority of cases well within the usual six weeks of isolation. The spread of infection by patients who have recovered and been discharged from the hospital appears to be very limited, only .8% occurring in Glasgow. The infective power of a positive contact or carrier appears to be very limited. In a disease of such a short period of incubation and rapid clinical course the development of prophylactic measures is always a matter of importance. The segregation of all infected contacts and other carriers of infection has aroused the keenest interest and even controversy.

Any hard and fast procedure is not warranted from our present knowledge of the subject bacteriologically nor from our clinical experience. *Harris.*

A Discussion Concerning the Results of the Ehrlich-Hata Treatment in Vienna.

Escherich (*Wiener medicinische Wochenschrift,* November 12, 1910). The important question as to the value of so active a remedy as Ehrlich's arsenobenzol must be first decided in various clinics, particularly in adult cases.

So little is known concerning the tolerance of young infants for this remedy that the greatest care must be exercised.

Ehrlich himself stated that the sudden destruction of the spirochetæ might result in a toxic condition. He recommended that as a beginning dose 0.005 g. pro kilogram of body weight should be used.

The author in his experiments started with this amount, and after satisfying himself that the injections did not do any harm, increased the dose to 0.01 pro kilogram, which is the largest amount that has been used.

Intragluteal injections are always used, and as a rule there is very little reaction. When first used the remedy was dissolved in methyl alcohol, but lately it has been placed in olive oil and the best results obtained.

The author's experiments were confined to nursing infants, and the cases were watched for a long time.

Six children were treated, and the following table will briefly show the results.

It is only fair to state that in the three fatal cases the syphilitic condition was so far advanced that they were considered hopeless from the beginning:

1. Infant artificially fed. Three weeks old. Premature birth. Papules on the face and extremities, saddle nose, with foul discharge; paralysis of both arms. Swelling of liver and spleen. Spirochetæ +. Wassermann +. First injection July 13, 0.04 g., followed by disappearance of paralysis and of the spirochetæ and increase in weight. On October 8, Spirochetæ —, Wassermann +. On this date there was a return of the symptoms, followed by death. Autopsy showed destruction of bony framework of nose, gummata of the liver and interstitial hepatitis.

2. Infant six weeks old. Artificially fed. Born with pemphigus. Extensive syphilides on the hands and feet. Sunken nose with purulent discharge. Spirochetæ +. Injection August 27, 0.01, followed by immediate improvement of all symptoms. Child died on September 5. Autopsy—Extensive atrophy of the organs. Perifolliculitis and pigmentation of the mucous membrane of the large intestine.

3. Breast fed child, aged six weeks. Papulous exanthema ad nates and on the legs. Rhinitis. Enlarged spleen. Spirochetæ +. First injection July 6, 0.04 g. On July 15th child was discharged from the hospital with only a trace of the exanthema and in a much better general condition.

4. Child aged four weeks. Breast fed. An extensive maculopapulous exanthema, and on the hands and feet diffuse syphilides with decubitus. Rhinitis. Spirochetæ +. Wassermann +. On August 19th, injection 0.016 g. Mother (Wassermann +) was injected on September 6, 0.4 g. This was followed by a fading of the exanthema, rapid healing of the ulcerated patches and a marked improvement in general condition. Spirochetæ —. On May 10th fresh papules appeared on the knee which, after injecting the mother, faded away. Child died later on, after a severe diarrhea. Autopsy—Diffuse purulent peritonitis (streptococci found). Large liver. Bronchitis. Atelectasis.

5. Child aged five months. Breast fed. Papulous eruption on face, neck, axillæ and legs. Rhinitis. Saddle nose. Mother is 22 years old and shows no signs of lues at this time. On September 10th mother was injected with 0.5. On September 24th child was brought to clinic much improved. Papules fading away.

6. Child aged three months. Artificially fed. For two weeks a papulosquamous eruption on the face, buttocks and extremities. Rhinitis and great enlargement of the liver and spleen. Spirochetæ +. Wassermann +. Injection, August 19th, 0.022 g. This was followed by a much improved general condition. Liver and spleen much smaller. Eruption fading. Spirochetæ —. On August 26th another injection of 0.024 g. was given. Spirochetæ —. In next few days, by August 29th, eruption completely disappeared.

A change for the better follows the injections so promptly that every unprejudiced observer must get the impression of a specific influence. The rhinitis seems to resist the treatment more than any of the other symptoms. Particularly marked and rapid improvement was noticed in cases with syphilitic bone changes.

In conclusion, the author states that the tolerance shown by infants for the injections would justify a gradual increase in the dose, and perhaps then Ehrlich's ideal of a therapia sterilisans magna with a single injection will be realized.

Theisen.

BOOK REVIEW.

Handbuch der Speziellen Chirurgie des Ohres und der Oberen Luftwege.

Edited by KATZ, PREYSING and BLUMENFELD. Published by Curt Kabitzsch, in Würzburg. Price, complete in four large volumes, 120 marks ($30.00).

Three parts of this new system of the surgery of the ear, nose and throat have already been delivered, and the importance and size of the work demand a preliminary review. This magnificent contribution to the anatomy and surgery of the ear and upper air passages is under the leadership of Katz of Berlin, Preysing of Cologne and Blumenfeld of Wiesbaden. The parts are being delivered as soon as published and contain about 50 pages each. When completed the work will consist of four volumes of over 500 pages each.

The central idea of the work is to give to specialists an absolutely complete review of all surgical procedures now included within our broadened surgical field, and at the same time to put in their hands an anatomic text book, the like of which has never been attempted under one cover.

Certainly the first three numbers are the finest examples of text-book making that have ever come into the present reviewer's hands. The first chapter on the topographic anatomy of the head, including the ear and nose, is by the famous anatomist, Sobotta, of Würzburg. The plates are all in colors, many of them new, and a large number of them taken from the last edition of his anatomy. The text is very brief and clear, the pictures explaining themselves.

The second chapter on the anatomy of the accessory cavities, by Onodi, has certainly been placed in the hands of the man who has done more original work along these lines than anyone in Europe. It is very complete, and he has selected for the article the cream of the numerous plates which he has so freely published during the last few years.

The work has been undertaken at enormous expense and has been in preparation for about four years. Each part will be assigned to someone especially well known in that particular line, and when finished will be the leading text book for many years to come. The publishers, who have had large experience in special publications, declare this to be the most important work which has yet come from their presses.

Horn.

ANNALS
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AND
LARYNGOLOGY.

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XXXVII.

EXAMINATION AND TREATMENT OF THE EUSTACHIAN TUBE BY THE AID OF THE NASOPHARYNGOSCOPE.*

By E. M. Holmes, M. D.,

Boston.

At a meeting of the Eastern Section of this Society in February, I presented an instrument which I had perfected for the examination and treatment of the epipharynx and eustachian tubes. I demonstrated the instrument, which I named the nasopharyngoscope, by showing 17 patients, each having a different pathologic condition in and about the eustachian tubes.

I gave a brief preliminary report of the use of the instrument in the examination of the posterior portion of the nose, the nasopharynx and the eustachian tubes; also described briefly the method of direct treatment of the tubes under the guidance of vision made possible by the nasopharyngoscope. I gave the results of this treatment upon the tubes, and also

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***Read at the Seventeenth Annual Meeting of the American Laryngological, Rhinological and Otological Society, June 1st to 3d, 1911, Atlantic City, New Jersey.**

upon the aural lesions caused by the pathologic condition of the tubes.

At that time I believed, as I had been informed by the manufacturers, that the instrument would be ready and in the hands of many of the fellows of this society within ten days, but owing to an error in the lens grinding, the first order was not satisfactory. This caused a long delay, and it has been a severe disappointment to me. It has detracted much from the present value of this paper, as I had hoped that many of our fellows would have had three or four months' study and experience, so that much could be added to our knowledge of the subject.

At the Eastern Section I promised to give a more complete report at this, the annual meeting.

We realized at the beginning of the work that it would require a vast amount of study before the anatomic variations, physiologic and pathologic, could be understood, for there are as many and marked variations in the size and shape of the eustachian tube as there are in the structures of the nose, or in other parts of the body. We have to learn how far in any case variations can exist without producing any effect upon the physiologic functions of the tube, and indirectly upon the ear. Were it not for the resulting aural complications, pathologic conditions of the eustachian tube would be of little importance. But it is a fact that over 90 per cent of all the diseases of the middle ear are due to disease primarily in and about the tube. We find cases where a slight swelling or deformity in or about the eustachian tube produces marked middle ear signs and symptoms, and again we have more pronounced and severe pathologic conditions of the tube without marked if any change in the middle ear. As we study these cases more thoroughly, and as our knowledge increases, we find in many of them the causes for the variable associations. There are so many local pathologic conditions to study and classify, so many degrees of resulting effect upon the ear, so many possibilities for various lines of treatment and so much to learn concerning the results of treatment, that it will take many months of individual and concerted study before we can speak with any degree of authority concerning this subject. This paper, therefore, is simply a record of the work thus far accomplished.

I have now examined with the nasopharyngoscope over 900 cases, and have classified 409 cases. I have also examined 64 cases, some of whom came to the eye clinic and gave no symptoms of catarrh in the nose or ear. We examined the latter cases to learn the conditions of the nose, epipharynx and tubes in cases giving no symptoms of nasal or aural disease. All the cases classified in this report were taken as they came for examination and treatment. I would have liked to have had an examination of the heart, lungs and kidneys in every case. It would also have been of importance to have had a bacteriologic examination of the secretion in the nasopharynx and ear. I found it impossible to examine and treat a large number of cases and have all of these examinations made. In every case the usual examination of the nose, the throat and the ear were made. The posterior portion of the nose, the epipharynx and the eustachian tube were also examined with the nasopharyngoscope.

To obtain the best results in examining the nose and epipharynx with this instrument, cocain should be applied to the lower inner wall of the inferior meatus of the nose. This is best accomplished without affecting the mucous membrane of the epipharynx by using a cotton-tipped wire applicator. When this area has become anesthetized the tube of the 'scope is passed through the lower fossa close to the septum. The fenestra of the instrument is directed upward until the epipharynx is reached, when it is rotated toward the opposite side. By advancing and rotating the instrument all of the structures in the nose and epipharynx can be brought into view. It is possible to examine every case in which a small eustachian catheter can be used, and in any case so deformed that this instrument cannot be used some nasal operation is absolutely necessary for other reasons than examination. The same statement is true in regard to the use of instruments for treatment. It would be useless to attempt any treatment and foolish to expect any lasting results in any case of epipharyngeal and aural disease where there was such deformity of the nose as to block either nasal passage.

For the treatment of the eustachian tube the 'scope is carried through the opposite side of the nose from that of the tube to be treated, and when the area of the tube is brought into view the instruments for treatment are carried through the side of the nose corresponding to the tube to be treated.

I have devised applicators for the epipharynx as well as for the lumen of the tube, and have made forceps and curettes which I have found to work satisfactorily in removing growths in and about the eustachian tube. I have also designed a syringe for carrying liquids into the tube, but have not as yet had sufficient experience with it to know of its value. In making applications into the tube much care should be used so as not to injure the mucous membranes. This I believe to be of great importance, for bruises or abrasions will result in a condition worse than we are endeavoring to relieve. I have found the cotton-tipped bougie to be of great service and to produce all the good results possible to be obtained with others, without the poor results which sometimes follow the use of other instruments.

In all cases of severe acute or chronic inflammation of the eustachian tube with much swelling and occlusion, we have been careful to make our first applications in and about the orifice of the tube only, and have not carried them into the tube until we were sure of drainage at the orifice. We have tried and are now using various solutions, but have found that a solution of argyrol has produced more marked results without producing any injurious effects than any other drug. There have been a few cases where silver nitrate solution has apparently been of great service, but in some cases the reaction has been too marked, and until our knowledge is greater I believe we must use this drug with considerable care.

Adhesive bands and growths in the lateral fossæ can usually be easily removed by the curette, but occasionally we meet tissue so hard that a cutting forceps is necessary. Soft bands can be broken by the finger, but we have found that they are much more liable to readhere than when removed by the curette or forceps.

In the cases of hypertrophy of the posterior end of the turbinate we can now see just where to adjust the snare and can remove as much and only as much as we wish. The posterior end of the lower turbinate quite frequently presses upon the anterior border of the eustachian tube, and many of these patients complain of a rumbling tinnitus which is often relieved as soon as a portion of the hypertrophy is removed.

As in other mucous membranes, all degrees of inflammation from the slightest injection to the most intense swelling are found. In some cases the tube is practically obliterated by an edematous swelling. We have occasionally found atrophy with the formation of crusts in the tube, giving the appearance of atrophy of the pharynx. In suppurative middle ear disease, pus is frequently found in and discharging from the tube. The mucous membrane on the floor and anterior wall of the tube swells more easily and to a more marked degree than that of the rest of the tube. At times the floor nearly fills the lumen of the tube.

In acute inflammations the mucous membranes may be as injected and swollen as in chronic cases, but the acute cases are more frequently reduced temporarily by cocain and adrenalin, while the chronic cases are much less affected by these drugs.

Growths in Rosenmüller's fossæ and upon the cushion of the tube are comparatively common, but within the tube they are rare. I have found but two. One of them completely filled the lumen of the tube and was attached to the floor posteriorly. It was found to be a myxoma.

Adhesions between the cushion of the tube and the posterior boundary of the lateral fossa of the pharynx are common and are often productive of aural symptoms, especially tinnitus. Adenoid tissue commonly fills the fossa and quite frequently is found extending to the cushion of the tube, and in a few cases even extending into the lumen of the tube. In children large adenoids not only press upon the cushion of the tube but greatly restrict its movements. In many cases the lumen of the tube is covered during deglutition. Adenoid tissue in the adult is much more frequently extensive in amount and a source of trouble to the tubes than is indicated by the posterior nasal mirror. We have found two cases of posterior nasopharyngeal abscess. One of these cases, in a man of 27 years, although causing pressure upon the cushion of the right tube, did not show in the posterior nasal mirror, and gave simply a spongy feel to the finger. Dr. Emerson, who saw the case with me, questioned the diagnosis. The abscess was opened through the right nostril and fully a dram of pus was evacuated. We failed to get a culture, although the swab was carried into the abscess cavity.

Another abscess, situated centrally in the epipharyngeal vault just behind the base of the vomer, was found in a girl of 19 years of age. It was about the size of a small grape and appeared similar to an adenoid growth in the nasopharyngeal mirror. The nasopharyngoscope showed that it was probably an abscess. It was opened through the nose and about half a dram of pus evacuated. The pus was very thick and showed a mixed infection. This patient sought relief from a thumping tinnitus of several months' duration in both ears. The eustachian tubes were somewhat inflamed, but were apparently free. There was considerable restriction of motion. The membranæ tympanorum were apparently normal. The tinnitus subsided in five days after the abscess was opened, and there were no symptoms at the end of the month, when the last examination was made.

Among all the cases I have examined, hypertrophy of the posterior end of the turbinate was found in 54 cases. In 17 of these cases the turbinate was so large as to press upon the anterior lip of the tube, and in one case nearly the whole tube was covered by a large lower turbinate.

In a case of severe and protracted tinnitus in a man of 32 years who had been treated without relief for several years, a very large lower turbinate pressed upon the anterior wall of the tube, while an adenoid about the size of a marble rested upon the cushion of the tube. The mucous membrane of the whole tube was swollen, injected, and granular. The middle ear showed a typical chronic inflammatory process. Removal of the adenoid and turbinal hypertrophy was followed by some improvement, but as the symptoms were quite severe at the end of six weeks, treatment of the tube was begun, and in five weeks the symptoms had disappeared.

Two cases of epipharyngeal polyps were found; one of these nearly filled the epipharynx and entirely covered the right eustachian tube. The other polyp was smaller but also covered the right eustachian tube. This was attached by a small pedicle to the posterior end of the middle turbinate.

Swellings in and about the lateral fossa may seem to be of little importance until the patient swallows, then there is often shown to be a marked restriction of the movement in and about the eustachian tube.

In chronic suppurative sinusitis of the nose, the mucous membrane of the epipharynx and eustachian tube is frequently of the same beefy appearance as that of the posterior pharyngeal wall. Purulent crusts are often in the lateral fossa and sometimes in the lumen of the tube.

Cardiac and renal diseases often produce that condition of passive congestion which we find in the other tissues. We have been unable to obtain any apparent results from local treatment in this class of cases.

In cases of gouty diathesis we have generally found angry-looking swollen mucous membranes. There is the same general appearance of the whole epipharynx and eustachian tube which we so frequently find in the pharynx and larynx.

Chronic indigestion and constipation frequently produce a condition of the epipharynx resembling the gouty type.

I have found but one case of diphtheritic membrane, and in this case the membrane covered the posterior ends of the turbinate and much of the epipharynx, even extending over and into the right eustachian tube. In the right ear was a very severe acute suppurative process. The Klebs-Loeffler bacillus was present, both in the epipharynx and in the pus from the middle ear.

We have seen two cases of syphilitic disease of the epipharynx; one a mucous patch on the floor of the tube, and the other an ulceration between the lower turbinate and the anterior lip of the tube. Both of these patients showed other manifestations of syphilis and both cases absolutely healed under mercurial treatment.

It would take far more time to adequately describe the cases of acute middle ear with bulging membranes than I can give to this whole series. I have, therefore, tabulated these cases as correctly as possible to give a general idea of the conditions and results and will here simply briefly review the chart.

For the same reason the other cases are here briefly reviewed, but I hope later to present a more complete study of the various conditions, giving a separate paper for each class.

In all there were 31 cases of acute secreting middle ear. The youngest was 6 years old, and the oldest was 64. The attacks varied from a few hours to several days. All of the cases when examined showed bulging membranes, and would have ordinarily been incised. They were all treated by applying cocain and adrenalin to nose, nasopharynx and eustachian tube, and after a few moments applying argyrol to the lumen of the tube. As you will see by examining the chart, the majority of the cases were relieved of the distressing symptoms as completely as by paracentesis, and nearly all were saved a discharging ear. The convalescence was also much shorter than in similar cases where paracentesis is performed. There were only two cases which were not relieved. One of these, No. 7, was at first relieved and suffered a relapse; three days later the membrane ruptured.

In case No. 13, I was unable to obtain relief of signs or symptoms, so I performed paracentesis.

What must now be done is to observe simultaneously an equal number of cases with and without this line of treatment, the untreated cases acting as controls. There must also be a bacteriologic examination of all secretions. It was impossible for me to investigate this series as thoroughly as I would have liked, as there were so many cases to examine and study. I am now studying cases of acute purulent middle ear and rupture of the membrane, and although to this line of cases I have not as yet given sufficient study to draw anything like definite conclusions, I am of the opinion that we are gaining much in treating the tube while we are treating the middle ear. A patent tube, if possible to obtain, must help to drain the middle ear as well as to prevent added infection from the epipharynx. If we can restore and maintain the function of the cilia of the tube we have, I believe, gained much.

We have classed all of the suppurative cases with perforation of the drum membrane as acute when they have not discharged six weeks, and as chronic when they have discharged longer than six weeks. In a large number of these suppurative cases there was adenoid present in the epipharynx. In nearly all the mucous membrane of the tube was swollen. In some it was of a granular appearance. In a few pus could be seen coming from the tube.

We have treated 26 cases of acute suppurative middle ear with ruptured membranes without signs of mastoid complication, and 8 cases which showed mastoid involvement. These cases had discharged from a few hours to six weeks. The youngest patient was 4 and the eldest was 68 years of age. In nine cases both ears were suppurative.

Among those 43 suppurative ears there were all degrees of severity, and the length of time from the beginning of treat-

vious tack	Duration.	Symptoms.	
one	13 hours.	Fullness 13 hours; pain 8 hours.	Acute puru ing.
one	24 hours.	Severe pain; first darting, steady for 8 hours.	Septum to nate hype
veral	12 hours.	Severe pain all night; intense at present.	Normal.
hen ild	48 hours.	Fullness 36 hours; pain 12 hours, very severe 8 hours.	Spur right; tion.
one	6 hours.	Pressure 2 hours, followed by intense pain.	Excessive days' cold
one	R. 40 hours. L. 3 hours.	Right, paint; left, tinnitus.	Deflection right tur phied.
hen hild	30 hours.	Fullness 24 hours; pain 6 hours, intense 2 hours.	Inflammatio
one	4 hours.	Right, jumping pain.	Normal.
years ago	40 hours.	Grippe for week; pain in left for 1½ days, very deaf.	Much inflam tion; ridg
veral tacks	11 hours.	Left, pain and roaring for whole night.	Acute purul
or 3	2 hours.	Snapping first; steady pain 3 hours.	General hyp
one	48 hours.	Pain, at first intermittent, steady for 5 hours.	General hy tion.

Fourth.	Fifth.	Later.
symptoms, except dullness of hearing. ne pink.	Ear well.	Twentieth day; removed adenoids from fossae.
llness, tinnitus.	Tinnitus only symptoms.	Eighth day; ear well. Advised removal of adenoids.
	Much fullness, no bulging, tinnitus.	Seventh day; no symptoms, membrane slightly pinkish color.
, severed bands in		
n, left tinnitus.	No pain, tinnitus relieved.	Eighth day; no symptoms; still some inflammation of epipharynx and tubes
eturn, no symptoms.	Pain last night; broke and discharged rupture posterior quadrant.	Thick pus for three weeks.
er.	Much better.	Tenth day; no symptoms for three days; hearing normal.
roved, hearing bet-	Improved.	Seventh day; well except deafness; ninth day; hearing 3/5; fourteenth day; hearing nearly normal.
ter; symptoms im-	Much improved; membrane retracted.	Eighth day; slight intermittent tinnitus; eleventh day; less tinnitus; 15th day; no symptoms.
er.		Sixth day; ear well. Advised adenoid operation.
ms, slight deafness.		Twelfth day; slight deafness, removed adenoids from fossae.

ment to the healing of the membrane varied from 5 days to 7 weeks. Two of the mastoids demanded operation. Four cases were not cured.

Of the chronic cases there have been 20 with a discharge of pus, 14 in which there was granulation tissue present, 13 with necrosis, 11 where symptoms and signs demonstrated a mastoid complication. Three of the mastoid cases also showed necrosis in the middle ear, and in four granulations were present in the middle ear.

In 11 of the chronic cases both ears were suppurative. This made 69 chronic suppurative middle ears observed. In all of these suppurative cases the usual middle ear treatment was used as well as the treatment by the eustachian tube. In 24 of these cases adenoid tissue was removed from the lateral fossæ and in a number this adenoid tissue extended over the cushion of the tube.

Five of the mastoid cases were later operated upon. Four apparently subsided as the membranæ tympanorum healed and no inflammatory signs remained.

Two continued to discharge after six weeks' treatment and refused to be operated upon. Seven of the necrosis cases were cured. Six continued to discharge.

Nine of the granulating ears were relieved and six resisted treatment.

Of the 31 simple chronic suppurations, 14 were healed. Eight were relieved, and nine were not apparently relieved.

Of the chronic catarrhal cases, 166 presented thickened membranes, 27 showed a thin atrophied membrane, 42 a retracted but otherwise an apparently normal membrane, and 51 showed cicatricial tissue and should perhaps be classed with the suppurative group, as they are the result of suppurative process. In this series, among those classed as thickened membrane, there were 63 in whom both membranes were thickened and one thin membrane. Five with one membrane simply retracted, 12 with signs of ol' suppurative process in one ear.

Of the symptoms associated with the chronic catarrhal ears, tinnitus was the most frequently relieved. The hearing was also much more frequently improved than by other methods of treatment. There were 2 cases of severe vertigo in this group, and they were entirely cured.

In closing I wish to emphasize the importance of being able to examine the epipharynx easily and thoroughly and to treat any pathologic conditions by the aid of vision.

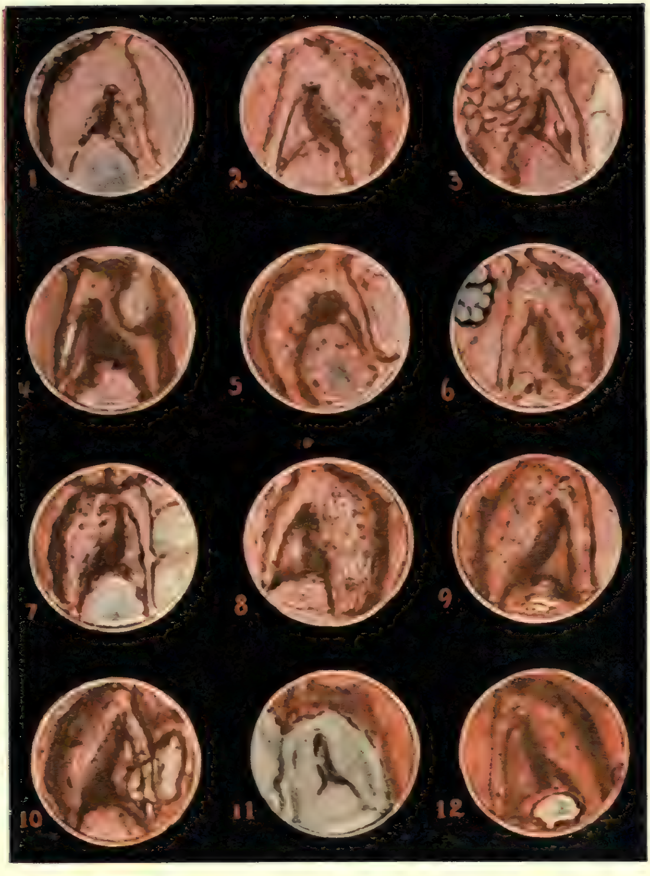
I wish also to impress the necessity for careful and extensive study of the pathology of this region, the association of aural disease with this pathology, and the results of treatment both upon the local condition and upon the resulting aural diseases.

Having attempted more than I ought in the time given and having to limit the length of this paper I have been obliged to generalize to quite an extent and to omit much which I would like to have and which should be presented.

This work has convinced me that we shall accomplish much in the future which we have been unable to do in the past.

DESCRIPTION OF COLORED PLATES.

1. Normal tube.
2. Bands across lateral fossa.
3. Adenoid tissue extending over cushion of tube.
4. Hard fibrous polyp attached to posterior wall of lateral fossa.
5. Swelling of floor of tube.
6. Angiomatous appearance of middle turbinate. Deformed tube.
7. Adenoid pressing on top of tube. Hypertrophied lower turbinate on anterior lip.
8. Hypertrophy of mucous membrane of tube.
9. Anterior swelling of membrane of tube.
10. Syphilitic ulcer of anterior lip.
11. Diphtheria of tube.
12. Syphilitic ulceration floor of tube.
13. Myxoma in tube.
14. Ligamentous band from anterior lip of tube to nasal septum.
15. Pus discharging from tube.
16. Large turbinate pressing on tube.
17. Deformed tube. Upper end of cushion wanting.
18. Deformed tube. Large posterior turbinate.
19. Adenoid in vault of epipharynx.
20. Stenosis of orifice of the tube.
21. Epipharyngeal polyp covering eustachian tube.
22. Deformed orifice. Nearly stenosed at isthmus.
23. Considerable atrophy of mucous membrane.
24. Marked hypertrophy of posterior end of lower turbinate.
25. Angiomatous lower turbinate.
26. Papillomatous growth on cushion of tube.
27. Adenoid tissue covering upper portion of tube.
28. Epipharyngeal abscess covering the upper portion of tube.
29. Adhesions across lateral fossa.
30. Adenoid growth in lateral fossa.
31. Marked deformity of tube associated with chronic suppuration of ear.
32. Very prominent tube.
33. Firm fibrous growth on cushion and in fossa.
34. Acute inflammation of tube. Double anterior lip.
35. Acute inflammation of tube. Lumen closed.
36. Walls of lateral fossa in contact. Hypertrophied lower turbinate pressing on anterior lip.
37. Pus dropping from sphenoid opening.
38. Sphenoid openings.
39. Epipharyngeal polyp.
40. Hypertrophied posterior end of middle turbinate.
41. Ethmoid cells after removal of middle turbinate.
42. Small polyps in middle fossa.
43. Large polyp in middle fossa.
44. Polyps in posterior ethmoid cells after removal of middle turbinate.
45. Floor of antrum of Highmore, tooth projecting.
46. Lateral wall of epipharynx in a case of peritonsillar abscess.
47. Opening through outer wall of lower fossa into antrum of Highmore.
48. Sharp spur at about junction of middle and posterior third of septum.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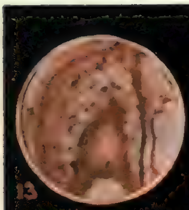
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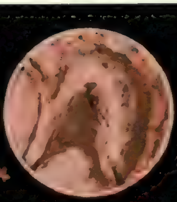
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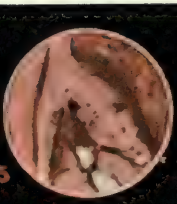
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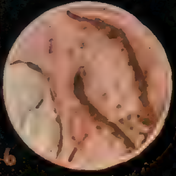
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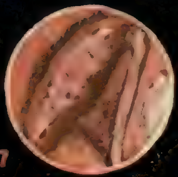
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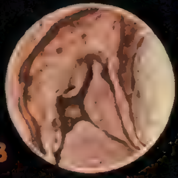
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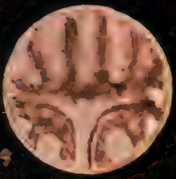
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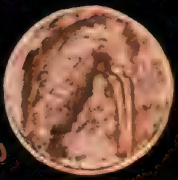
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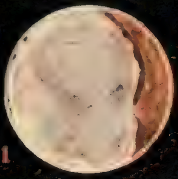
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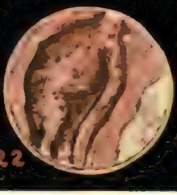
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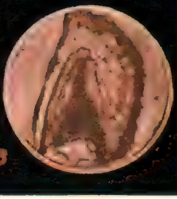
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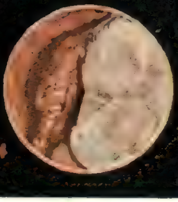
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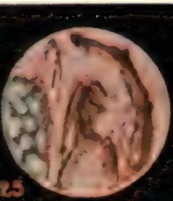
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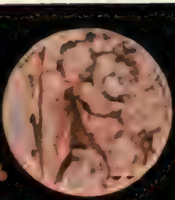
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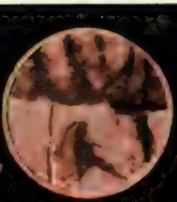
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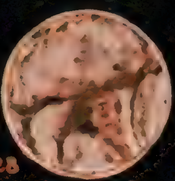
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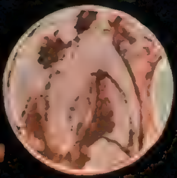
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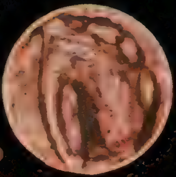
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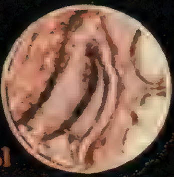
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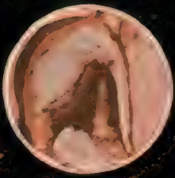
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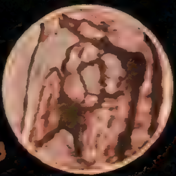
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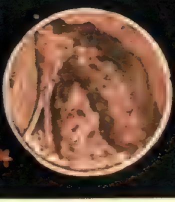
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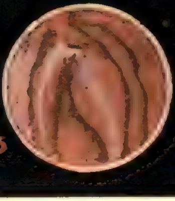
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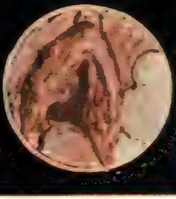
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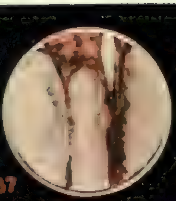
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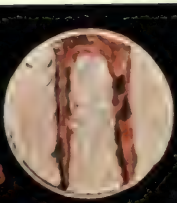
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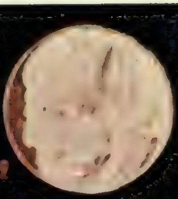
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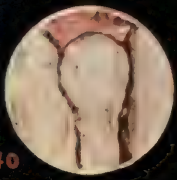
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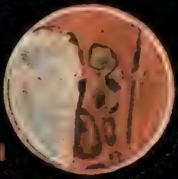
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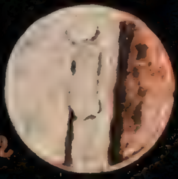
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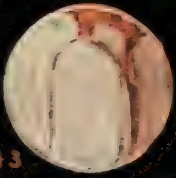
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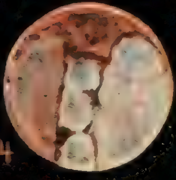
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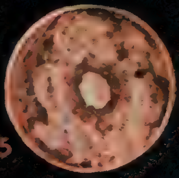
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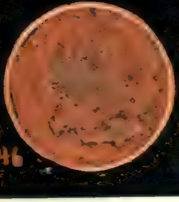
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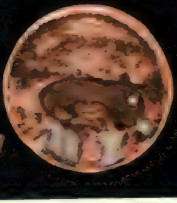
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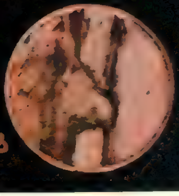
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XXXVIII.

THE ACTUAL CAUTERY IN THE TREATMENT OF LOCALIZED TUBERCULOUS LESIONS.

By George B. Wood, M. D.,

Philadelphia.

For some time I have felt that the actual cautery, and preferably the platinum wire heated by electricity, is by far the most effective method of combating tuberculosis of the upper respiratory tract. The striking results which have followed its use in cases of pharyngeal tuberculosis have confirmed my belief in its efficiency. If a pharyngeal lesion is not too extensive and can be reached by the heat, I am of the opinion that if treated with the cautery it will in all cases heal promptly, at least such has been my experience.

The good results following the use of the cautery are equally great in the larynx, provided the lesion is so placed as to make it accessible to the action of the heat. The beneficial action of the cautery seems to reach distinctly beyond the area of destruction, and the resulting scar does not appear to be easily reinvaded.

Last fall I removed with the cautery snare for diagnostic purposes, a suspicious looking tonsil from an arrested case of pulmonary tuberculosis. The portion of the tonsil removed showed extensive typical tonsillar tuberculosis, consisting of minute young tubercles scattered throughout its extent. Five days later I removed the rest of the tonsil. The result of this last piece of tonsil was most interesting and led me to make a small series of experiments on guinea pigs. The scar in the portion of tonsil removed was surprisingly large and apparently already made up of well developed fibrous tissue, and only after the examination of a considerable number of sections did I finally discover a single small miliary tubercle, and this seemed to be already undergoing fibroid change.

EXPERIMENTS ON GUINEA PIGS.

The object of these experiments was to determine the histologic appearance of a cautery wound made through a tuberculous lesion. The series is somewhat short, but demonstrates certain peculiarities in the healing of the wound which are important in relation to the cure of a localized tuberculous lesion. It was desired to produce a superficial localized tuberculous lesion. For this purpose an attenuated culture of human tubercle bacilli which had been grown through five generations on artificial media was used. The culture from which the bacilli were taken was three weeks old.

On February 15th one c.c. of an emulsion of the above culture was injected just beneath and into the skin of the abdomen of three guinea pigs. Each pig was inoculated on each side of the abdomen so as to make two distinct and separate lesions.

On March 7th pig No. 1 showed marked induration of the inoculated areas, and on the left side there was some sloughing in the center of the lesion. About three-fourths of the lesion was cut out on the left side, and about half the lesion on the right side was destroyed with the electric cautery. The piece of skin removed from the left side was hardened in Zenker's solution imbedded in paraffin and sections stained with hematoxylin and eosin. These sections showed a large central lesion of epitheloid cells with slight necrosis in the center; surrounding this were a few isolated discrete tubercles composed of epitheloid cells. There was very little tendency to the formation of giant cells and there were numerous polymorphonuclear cells scattered throughout the central lesions and massing on the surface.

On March 13th the animal was killed, the lesions removed and hardened in Zenker's solution. Sections were stained with hematoxylin and eosin and also with Mallory's connective tissue stain. Macroscopically the lesion which had been cut showed advance and the skin was apparently adherent to the abdominal muscles, but there were no tubercles on the neighboring peritoneum. The burnt lesion macroscopically appeared to be healing and was not adherent to the underlying muscle tissue.

Under the microscope the cut lesion showed the ordinary histologic appearance of tuberculosis without the formation of giant cells. There was considerable necrosis, some extension into the surrounding muscle tissue and some new fibrous tissue. There were a few new-formed blood vessels, but no marked inflammatory reaction.

The burned lesions showed considerable tuberculous tissue, but around the margin where the slough following the cauterization had come away there was a marked inflammatory reaction. There were numerous new blood vessels, most of them were filled with blood, and the formation of new fibrous tissue was very marked. Outside of this zone of reaction the tuberculous tissue appeared apparently unaltered, and there were some tubercles in the surrounding muscle.

Pig No. 2. March 28th cauterized both abdominal lesions.

March 31st. Pig killed. The skin lesions were removed and hardened in Zenker's solution. Sections were stained in hematoxylin and eosin. The inguinal lymph glands were enlarged and caseous. On both abdominal lesions the eschar was still adherent and there seemed to be a slight shrinking in size of the tuberculous area since they had been burned.

Microscopically the lesion showed a considerable area of tuberculosis, unaltered except in a zone surrounding the base of the eschar. Here the inflammatory reaction was fairly well marked and the new blood vessels, while not so numerous as in the burned lesion of pig No. 1, formed a distinct zone, many of them being filled with blood. There was some tuberculous infiltration of the surrounding muscle tissue.

Pig No. 3. March 26th cauterized both abdominal lesions and punctured an enlarged right inguinal lymph gland with cautery point. The node was completely caseous, a large quantity of the material escaping when the platinum point went through the capsule.

April 17th. Pig killed. The lesions in the abdominal wall and the left inguinal lymph gland were removed and placed in Zenker's solution. Sections were stained with hematoxylin and eosin and Mallory's connective tissue stain. Macroscopically the lesion on the left side of the abdomen showed a healthy, shallow, raw surface without induration, and probably was caused by breaking a partially healed wound by rough handling. The wound in the right side of the abdomen was so nearly healed that it was difficult to find until the hair had been removed. There was a slight induration along the scar, and at one end there was a small crust, which showed the wound had not completely healed. There was a beginning general miliary tuberculosis.

Histologically the left wound appeared as a shallow ulcer with a small amount of necrosis on the surface and numerous polymorphonuclear leucocytes. There was some tuberculous tissue in the immediate neighborhood, as evidenced by the presence of epitheloid cells. The right wound showed a healed surface with a rather large deposit of fibrous tissue, but underneath this a small area of epitheloid cells. The inguinal lymph gland showed a small, healed punctate scar, but it was so completely caseous that the histologic study did not show anything of interest.

SUMMARY.

In three days after the cauterization of a low grade tuberculous lesion there developed a distinct zone of inflammatory reaction around the area of destruction. This reaction was manifest by the presence of newly formed blood vessels, congestion and fibroblasts. Beyond this zone of reaction the tuberculous process seemed unaltered. In six days the zone of reaction was much more marked, the blood vessels being more numerous and larger, and there was a distinct deposit of fibrous tissue between the epitheloid cells of the tuberculous mass. The tuberculous process beyond the zone of reaction was apparently unaltered except that it seemed for some reason less in extent. In twenty days the lesions were to the naked eye almost healed. A fibrous cicatrix had formed in the zone of the inflammatory reaction, and though there was some tuberculous tissue still present beneath the scar, the amount was very small and becoming gradually cicatrized.

These few experiments seem to have substantiated certain clinical observations as regard to the use of the cautery in treating localized tuberculosis. There is no doubt that a retarding influence is exerted beyond the area actually destroyed by the heat. We know that a tuberculous nodule heals by cicatrization, and therefore anything that aids in the formation of fibrous tissue aids in the cure of the disease. Further, by the induction of acute inflammation with the subsequent formation of new blood vessels, nutrition is brought to a part which would otherwise break down into a necrotic mass because of a lack of sufficient food to nourish the tissues. Again, the eschar produced by the burning prevents reinoculation until the tissue has become sufficiently resistant to protect itself. Also the cauterization seals the lymphatics and blood vessels, thereby preventing a spread of the disease either locally through the lymph system or generally through the blood vessels.

XXXIX.

THE MORE EFFICIENT METHODS OF AURAL MASSAGE.

By Alex. Randall, M. D.,

Philadelphia.

The theme chosen could hardly be less novel, not only because Simeon in the 11th Century headed a long list of writers on the subject, but because late years have seen so many articles and inventions in the matter that now the appliances actuated by mouth-, hand-, hydraulic-, or electric-power are almost as numerous as the users or even as the patients submitted to them. It is because of the bewildering wealth of material and the diversity of views expressed, that I shall essay to winnow out some of those points which have best met the needs of my experience. Others have doubtless as much right to enunciate conclusions differing from mine; but I believe that those who have not yet crystalized an experience of their own, will find my suggestions helpful.

Amidst the variety of apparatus, there is some risk that the principles may be lost sight of and the practice consist mainly in turning upon the patient some especially commended masseur. So it will be well to recall that the ideal form of massage is that by the voice, even though few will undertake to use it rightly. Yet there are cases credibly reported in which an adult reared as a deaf-mute has had his vestiges of hearing so developed by a devoted wife's persistent use of her voice that it has become possible for him to hear and understand an unseen speaker in another room. But this is an electric age; and that man is regarded as quite fossilized who undertakes to use the voice for any such purpose except through the medium of some up-to-date microphone. Twenty years ago a competitor for the Lanval prize fairly proved that the microphone has no practical value for the deaf and its inventor is said to prefer a big tin trumpet. But thousands are spent annually in advertising the wonders wrought by such instruments, doubtless with a profit of tens of thousands to the advertisers.

It is too generally ignored that the benefit of the telephone, of whatever form, is in "transposing" the pitch of the conversational voice out of its ill-heard register into a higher key where the listener's hearing is little, if at all impaired.

The magnification of the sound is usually a drawback, being of the sounds least desired; and it can be distinctly detrimental. The usually attenuated sounds transmitted by the telephone can be exhausting to the ear, if only because of the attention required to hear them amid any irrelevant sounds and because of the jarring noises sometimes intercurrent. The massage value of such tones is minimal, since their pitch is often such as to allow them to pass directly through the drumhead to cause molecular vibrations at the fenestra, with little or no vibrations of the chain of ossicles.

Most of what has been accomplished with massage-apparatus we owe to Siegle (*Deutsche Klinik,* 1864), whose pneumatic otoscope remains one of the best appliances at our command. A bulb excels his earlier method of giving the pressure and suction, although we are generally wise to use no more force than can be obtained by the mouth, i. e., probably about 5 pounds of positive and negative pressure. Under its use the response of the tympanic tissues can be in great measure seen, both as to their mobility and their injection, under such stimulation. The criticism has been advanced that all congestion is harmful and tends to further sclerotic changes. On the contrary, we have no other means so capable of obtaining absorption of pathologic exudates. Whoever has studied in the eye the absorption wrought by dionin, or the clearing of corneal opacities under massage with ung. hydrargyri oxidi flav., can readily refute such a mistaken claim. That the massage can be abused only proves its potency, unless it can be shown that it cannot be employed without excessive action. Examination of the ear shortly after such congestive response demonstrates that injection has soon disappeared; and the main value which I claim for my method of spraying dionin per catheter is that its congestion of the tympanic mucosa serves to promote absorption of the pseudo-anchylotic bands or thickenings. The pneumatic speculum should not be too deeply introduced, should not press too much on the veins of the front wall, damming up the tympanic effluent (although some of this is advantageous, as in Politzer's plugging of the canal in the hope of causing absorption of the air outside as well as within the drumhead); but too marked a "passive hyperemia" might cause extravasations. A bit of rubber tubing should usually be placed on the tip of the speculum to insure gentle air-tight closure of the meatus without bruising: the bulbous tip of the Delstanche and other instruments is rarely so good.

Some writers have so little grasped the principles of the use of the masseur as to deny that any appliance except some modification of their own permits of suction. Any form of the instrument, simple or complex, can be made to give positive or negative pressure, or both. Individual preference will modify the instrument in various details—for myself I much prefer the magnifying form as making quickly clear many details of the fundus which might escape even prolonged study of the unenlarged tissues. The pertinent fact is that valuable massage of the drumhead and ossicular chain can be thus accomplished. We are usually dealing with a depressed drumhead and wish to restore it to its normal tension and position. Suction rather than pressure is to be used; but all of our efforts to "suck outward" the drum membrane avail nothing unless there is air in the tympanic cavity. Our lessened pressure without permits the expansion of what air is within the tympanun to force the drumhead outward. Failure to secure visible motion may not signify adhesions or rigidity—only an absence of air back of the tympanic membrane. Hence, inflation by the Politzer method, or better as a rule by the catheter, may be prerequisite to any mobilizing of the drumhead and the ossicular chain by pneumatic massage.

A perforation of the tympanic membrane may preclude any difference of pressure change on its inside and outside, and our pneumatic massage then fails to elicit any visible motion. This does not prove that no motion is secured; on the contrary, any fluid in the tympanun may be seen to move. The varying pressure upon the stapes and round window membrane may excite marked motion with nystagmus, vertigo and even syncope. The most striking examples of the "fistula symptom" are often cases with no history or sign of suppuration, but presumably with a very relaxed stapedo-fenestral articulation. Light massage may bowl them from their seats more easily than violent syringing would do it for other patients. So the absence or immobility of the drumhead and ossicles does not mean that we can accomplish nothing useful by our massage. As before intimated, the mere cupping effect may by its congestion increase the plasticity of the parts with ulterior, if not immediate, advantage.

Since the effect of the pneumatic massage upon the broader surface of the drumhead may be far more potent upon the important factors of the conducting apparatus than that exercised through a perforation, it is well to remember that the open drum membrane may be closed and perhaps instantly mobilized by the application of Blake's paper patch; and it is often for this special purpose that I employ this device. Conversely, it is often the pneumatic speculum which enables us best to adjust such patches and test the snugness of their application to the margins of the perforation, which we wish to excite to reparative activity. I am a firm believer in the usual necessity of a mobile drum membrane for the hearing of tones of low pitch; and as the rapidity of the vibrations of even our most rapid pneumatic masseurs is often far below that of the lowest audible tones, there is full need to avail ourselves of this rehabilitation of the impaired conducting apparatus.

The matter of the direct manual massage of the conducting structures of the middle ear is too little dealt with by most authors. We know of Lucae's spring probe, though so little that one of Politzer's translators called it "Lucae's feathering-sound" and many were none the wiser or less so. Those who have seen or read of the device have generally been repelled and have made little or no use of it or its substitutes. Lucae himself gave up most of his mechanical additions and later preferred it in its simplest form; and this can well be further simplified by leaving off the spring. Any light probe, cotton tipped, can serve the purpose—preferably the Harrison Allen cotton carrier. It is often notoriously painful as Lucae advised it: its tip was sometimes frozen to secure a benumbing of the short process or other parts touched. This is quite needless if we will cover its cotton tip with a salve—preferably of sticky lanolin: then we can get both traction and pressure on the parts acted on, but so cushioned by the yielding buffer of salve that no spring is desired; and the light hand can impart to the precise region needing it a rapid and painless direct motion. And this often has its best uses after the destruction of the drumhead and larger ossicles, for we can work directly with the stapes and round window membranes, stretching adhesions and effectually mobilizing conditions of pseudo-anchylosis. I have published cases of signal gain from this measure, as when in a lady of 30, whose useless right ear had been pronounced past all aid by some of our best men, the hearing was raised to hearing a forced whisper at five meters, and continued her sole dependence for the rest of her busy, useful life.

No small part of the efficacy of this direct massage lies in its inunction of medicaments capable of aiding the restoration and maintenance of mobility; so the tip of salve upon the probe can be adapted to the requirements of the case. The yellow oxide of mercury has been my chief reliance, stimulant and absorbent in action; but ichthyol or its preferable alternate thigenol, has been much used in cases calling for more sedative effect. Not rarely in the chronic catarrhs, especially in more advanced life, I have been gratified by the good effect of phosphorus oil, 1 per cent, commended as a help in "presbykusis" by Sapolini. It may be wiped over the drumhead and walls and then gently rubbed in by the massage as applied by the cotton tipped probe to the short process, posterior fold and other regions. No "sweet oil" will surely remain sweet in the warm auditory canal, and so this application has in a few instances irritated sharply; or it may have been incompatible with some other medicament simultaneously used.

Many regard all hand-power appliances as obsolete and use and advocate those actuated by hydraulic, pneumatic or electric motors as the only up-to-date instruments. Some employ the massage for five, ten or even twenty minutes at a sitting—a practice which cannot be commended—and must save themselves this tedious manipulation. Some regard the speed of vibration required for the best results to be beyond that obtainable by the hand. It is difficult with the Siegle actuated by hand-power to get ten actions per second, while the other devices may much surpass this speed; and it is argued that the lowest tones audible are above 16 if not 32 per second. Still it is true that good results can be secured by the slower motions, with perhaps greater safety than by the more rapid; and I believe that muscle-sense and brain are better controllers of the massage than any mechanical device.

On the other hand, to offset the value claimed for such automatic appliances as the electric masseurs must be placed the danger of rhythmic massage. We have long known that the bridge is in peril on which too many persons or cattle are moving in step; and the molecular changes which deteriorate metals and other dead materials still more endanger living tissues. A persistently vibrating tuning fork among guinea pigs quickly induces cataract in their eyes (v. Stein). The dentist has had largely to abandon the use of the electric hammer, which beautifully compacted the gold of his fillings but killed the nerves beneath. Similar vibrations will doubtless degenerate the cochlear nerve with its ganglion cells and terminal organ, although the experiments of Wittmaack and others are not conclusive. We often find catarrhally deaf patients with more nerve involvement than could be expected from the age, the duration or the other elements of the case; and the question, "Have you been using an electric vibrator?" is usually affirmatively answered, sometimes with the declaration that there has been evident loss since its use. It is easy to collect many parallels in the occupational deafness of the boilermaker and other workmen. The vibraphone and similar devices put forth a decade or more ago were advocated especially by the homeopaths, perhaps because the harm done by the telephone gave, by the "law of similars," promise of benefit to the deaf. Those who employed them found that they did indeed stir up the torpid ears; but that they soon exhausted dangerously the nerve power. They silenced tinnitus (in cases where they did not cause it); but often they so reduced perception that all objective as well as subjective noises were lost. These banjo-like machines have sunk into silence, to be replaced by similar "buzzers," one of which (as I was assured by its medical advocate) has cured a deaf Queen and received at her hands a medal of honor. The tuning forks have been tried in this matter, especially in Paris, but, as one of our colleagues has reported, with results not yet satisfactory.

Most of such appliances, like the perpetual motion machine, lack the "adjustment of one cog" to complete the perfect apparatus. Some measure of vibratory pneumomassage as well as phonomassage has been claimed for many of these inventions; but careful testing failed to substantiate any such action in those which I studied.

Hand power cannot, try as we may, be dangerously rhythmic; and for any length of "seance" which has seemed to be reasonable, has not been overtaxed in giving this pneumomassage; while the eye behind the Siegle speculum can measure the effect in motion and congestion, and so may control the force and rapidity of the vibrations propagated through the conducting apparatus. The dosage may thus be determined with much accuracy; and the attention can be devoted to the ear under treatment instead of to the management of a complicated piece of mechanism.

Yet the evil influences that make for the impairment of the hearing are almost ceaseless in their activity, while the surgeon's measures of relief are occasional and often too much interrupted. A massage that can be put in the hands of the patient may be of great value, if it be not dangerous. Such a measure was given us in the "Tragus-presse" of Hommel; but I believe that I much improved upon it in the "massage by the finger-tip," which I have long advocated (*Philadelphia Polyclinic*, September 28, 1895). It can well be employed by the surgeon, the patient or any other, with no need for apparatus; and some twenty years of its use has never showed me any harm from its free employment. It should be dosed in accordance with the response of the ear to the pneumatic speculum and limited to such duration, force and frequency as has thus been seen to be expedient. Like all simple measures, it is easily improved upon by beginners who have not yet learned it; but I have not yet found a better form than that which I first advised. The pulp of the (middle) finger, generally of both hands simultaneously, is introduced into the meatus, drawing the tragus forward by slight rotation and pressed as deep as the dropped jaw will permit. Then gentle pumping movements in and out furnish a massage which is mainly by suction and can be safely continued from thirty to sixty seconds at varying rates of rapidity. It can be as slow as sixty per minute or less, or quickened until as a mere tremor it is more than ten per second; while the degree of excursion can regulate the force as fully as in the most perfect mechanical masseur. This can well be alternated with similar pumping by the flat of the palm, stretched tight as it is laid in contact with the auricle and arched by slight flexion of the hand. This latter measure is so inconspicuous that the patient, as though smoothing the hair, can apply it unnoticed in the most public place and lift a burden of deafness and tinnitus just at the moment when such help is most desired. It makes also the readiest means of relief in vertigo and faintness occurring under treatment: supplemented, of course, in the latter case by causing the patient to bend forward so as to bring the face close to the knees. A half dozen applications of this hand-massage each day have seemed none too much, and have been most useful adjuvants to the periodic treatments by the surgeon; and they well can be continued during the intermission of other measures.

Of the more elaborate forms of massage of the eustachian tubes by the bougie, simple and vibratory, I have little here to say except that they are dangerous in even the most expert hands; but I cannot sufficiently insist upon the value of the gargle as a gymnastic and massage of the tubes and pharynx. Medicaments are often poorly applied by gargling; but we have in heat one that can reach where the hot water itself does not reach, and its constringent effect is equalled by few drugs at our command. A stroking massage of the neck between the ear and the ramus of the jaw can make itself well felt by the eustachian tube, but it is rarely used to much advantage except in expert hands; while the wonder-working manipulations of the osteopath have never within my observation been availing except in extracting fees from the credulous.

In closing this plea for the recognition of the dangers of phonomassage as well as of all pneumatic or direct massage that is regular and rhythmic, I wish to insist that there is some pro and con to every measure that has here come under discussion; and in the hands of experts who give unflagging attention to avoiding their evils, they are all capable of being used to the advantage of our patients. But there are devices of almost ridiculous simplicity that fully equal them in my opinion for all good uses. The safety and availability of the simple old Siegle speculum and the home use of hand massage, gargling (especially hot gargling) and such every day measures, precludes that they shall ever become obsolete. Let us strive, each and all, to be up-to-date in our knowledge and utilization of every good thing that can benefit our patients; but in this as in all else that is admirable, may we all be "gentlemen of the old school."

XL.

ARE THE TONSILS A MENACE OR A PROTECTION?

By Henry L. Swain, M. D.,

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If, in answer to the above question, we were to judge of the opinion of the majority of operators in this country on the principle that "a workman is known by his chips," or to form an idea as to how necessary it is to remove the above mentioned menace by the amount written upon the subject, and the multitude of ways described, and the instruments devised in the last four years to carry out the alluring, spectacular, and gory operation called tonsillectomy, we would not only assume that everybody thought tonsils a dreadful thing to have around, but that any physician or surgeon who did not, on sight, enucleate every tonsil was not only derelict in his duty, but a renegade deserving lasting contumely.

When an author speaks of his experience in upwards of 9,000 cases, mentioning especially 3,000 removed within the capsule—the only method which he thinks is really worth while—within the last six or seven years, he certainly has a right to speak advisedly as an expert in regard, at least, to methods. Also, it will be readily deduced that he felt that in removing tonsils thus wholly he was not depriving the patient of anything important. When, as is the practice in recent years of many operators all over the country, to always enucleate the tonsils as completely as possible in all cases, either children or adults, as a routine procedure, it would certainly seem to argue that, in general, tonsils are better out than in. The question of relative size, appearance, healthiness of structure, or any such matter is apparently never thought of. Remove anyway, and dismiss the matter as not worthy of further consideration.

Take this association, the leading exponent of, and representing the most enlightened sentiment in this country, if not the whole world. Its opinion is looked up to as expressive of the broadest and deepest possible insight into the problems of the physiology and pathology of the upper air passages. In our annual meeting, in Boston, two years ago, presided over by Professor Coolidge, only one man had sufficiently the courage of his convictions to say a word apparently in contradiction to the tremendous weight of the general opinion of the men present. He said: "The question of the removal of the tonsils revolves upon the point of whether the tonsil is a necessary organ or not." "We should remember," he further stated, "that they have an internal secretion sui generis, both afferent and efferent lymph vessels, and although there may be diseased tissue or crypts, we could often take away enough of these deformities, and yet leave enough of the organ to perform proper functions." In keeping with this view, he thought that he knew of patients where, in view of later developments, he wished there had been left in them some of the tonsil tissue he had removed. This view was expressed by the elder Shurly, and any formal statement from him is entitled to all the serious consideration which his broad experience and great learning justify.

He was followed by Dr. Casselberry, who frankly stated that he believed just the contrary, and lived only to regret that he had not removed more rather than less. And those of you who attended the annual dinner remember how he went so far as to very drolly describe how he was supposed to have dreamed, while asleep that afternoon, that in the next world he was persecuted by the ghosts of those who had gone there because he had not removed their tonsils, or enough of them.

All those who spoke seemed to favor Dr. Casselberry's belief. Only one, Swain by name, in discussing a later paper on the following day, expressed his opinion that the tonsil was of the same importance, no more, no less, as any other lymph node. If one had incised the neck for any reason, it was not thought necessary to take out all the lymph nodes because they were visible or palpable. Only when they are thought to be diseased do we remove them. So, it seemed to him, it should be with the tonsils: If in the way because too large, why not do as we always used to do, and take away enough to fill the bill and leave the rest? If diseased, then, and then only, do a tonsillectomy. Tonsillectomy as a routine procedure especially in the young would then be entirely unjustifiable under any other than diseased conditions, unless we could rule positively that the tonsil has no function.

A most intelligent and enlightened physician who, quite contrary to the usual rule among such, is the father of a large family, last year had to have the tonsils of one child removed because, during the previous winter, the child had an attack of general cervical adenitis which was slow in subsiding, causing the father to fear that the tonsils might be tuberculous. While the surgeon laryngologist was at the house, he had a younger child who had never had any trouble with his tonsils, but who might possibly have, also completely robbed of his adenoids and both faucial tonsils. This winter cervical adenitis was much in evidence, and his family was one of those attacked. The first child in the family to succumb was the younger one who was especially operated upon to avoid it. He had it the hardest, and his glands were much slower in going down that two of the other children whose tonsils, by some oversight, were still present in their interiors. The older tonsillectomized child was away from home. Certainly the tonsils in the younger were not a menace, for they were not there, but their absence might have been, and the whole clinical history thus briefly chronicled plainly points to the fact that the absorption into the cervical lymph nodes probably was not through the tonsils at all in any of the cases, but that the tonsils only enlarged just the same and for the same reasons that the other lymph nodes did.

Two students, from different cities, were treated by me for sore throats during the fall term of year before last. This last fall I treated them for the same kind of sore throats which they had had the previous year, and each had glandular enlargements in the neck. In examining their throats there was disclosed a harrowing tale. The executioner had been at work, and plainly did it show. They had each, in an unguarded moment, told their respective families that they had had, during the previous year, a severe sore throat. Each was hurried to the family specialist, and the tonsils found enlarged and a menace; they were condemned to the block, and each tonsillectomized. One had to have the pillars of the palate on both sides sewed together to stop the hemorrhage. The resulting cicatrices had caused a considerable tightening and consequent interference with the motion of the palate. The other had lost the posterior pillar of the palate, and a rude adhesion narrowed down the opening into the nasopharynx on that side. The former came out of the hospital weighing fifteen pounds less than when he went in, was a long time in recovering his strength, and had been brought that low because his tonsils were a menace. I have treated him three times for sore throat; once before, twice since the removal, and each time the nasopharynx and the lateral columns were the part primarily involved; the tonsils, on the first occasion, only secondarily, if at all.

The same thing happened to the very erudite and exceedingly close observer who is now in the act of reading this paper to you, only being of a conservative nature, and holding pretty firm convictions as to his duty, he had simply followed, as we all do, his routine hobby. A Vassar girl came with the report that she had frequent attacks of tonsillitis; could Dr. Swain prevent them? Surely. He freed the small tonsils from the pillars, slit up the connecting crypts, removed the contents of the crypts, and shrunk the general mass by ignipuncture. Result: tonsils small, nodular, flat and discrete. Patient gained four pounds in weight during the treatment, as is often found to be the case. Her pillars were all right, and there were no deformities anywhere, and no serious hazard to life. She, too, went back to college, and promptly was sent home sick with sore throat. Dr. Swain was interrogated over the telephone as to what he thought of the matter. He replied, voicing his ignominious chagrin, but begged to have one last, long lingering look at the fair maiden's throat. It was reluctantly granted. He discovered that he, too, had been incorrectly informed, as the home doctor had in the previously reported cases, and again it was the lateral column of the pharynx which was involved. Proper operative treatment was undertaken, and the young lady has never, to my knowledge, had any further trouble, and this happened five years ago.

If further comment is necessary upon this sad picture of two very eminent men and my lesser self so readily led to butcher the tonsils each in his own way, it is to state more definitely the purpose for which this sorrowful tale was here introduced, viz.: to show how universally exists the readiness to blame the tonsil; and furthermore, how little we know, or how little we deduce from the appearance of a tonsil as to how much of a menace it really is. None of us (for I personally know and vouch for both of the other men) would have, for a moment, put the patient through what we did, had we not supposed it was our duty. We will cheerfully admit that the evidence was wrong, but it does not change the facts. And what happened to us is frequently happening all over the world, viz., that tonsils are unnecessarily subjected to our surgery; and may this not come from an entirely erroneous conception of our problem? Certainly it would seem that we all believe that the tonsils, especially the faucial tonsils, are not of much account and are a menace, or there could be no justification for our enucleating tonsils in young children as a routine procedure when they are simply enlarged and when in years past a simple tonsillotomy has given such general satisfaction.

Furthermore, there is the undeniable fact that the good which the tonsils may do is believed to be so small, and on the other hand they seem to be the cause of so many systemic diseases, many of them of the severest type, that if one could remove a source of infection so easily the good thereby done would more than counterbalance the harm resulting from any loss of function. Or, to put it another way, it would be necessary to prove that the tonsils do have some function, some definite office to perform, before we even hazard the raising of a hand to call a halt on the indiscriminate removal of these structures from their snug resting places.

It would also help the cause along if we could prove that often, instead of removing the cause of tubercular infection and rheumatism, we really took away one of the life guards which in health, at least, prevent the trouble from going deeper. We have already hinted at a line of argument which readily showed that often at least the faucial tonsils were credited with causing systemic disease of which they are really only sometimes the cause, and frequently the enlargement may have resulted from disease in other situations, sometimes the very disease we hoped to cure by tonsillectomy.

To discuss the last point first, the question of tuberculosis and rheumatism. For both these causes it is now the custom to extensively advise the enucleation of the tonsils. The internist has added impetus to the movement by many times going so far as to insist that in every case of rheumatism, or even in indefinitely recurring rheumatic manifestations, the tonsils should be removed, meaning by removal enucleation—always in the adult, a serious operation. This is done in some instances entirely by rule of thumb, never even inquiring or still less caring whether the tonsils were even previously sore or in any way connected with the clinical process. As a result of this general working rule some very brilliant hits are made, but apparently fully as large a number are put through the mill without an atom of good resulting in any way, for, as before stated, the tonsils may be absolutely innocent.

Now it is a most excellent condition of things, in one way, to be operating laryngologist to a busy internist who takes the entire responsibility of removal. Failures and successes are alike credited against him, but it is a case of blissful inexactness which I consider deplorable. It would seem to me that any well equipped laryngologist could, with a little care and thought and watching, easily tell whether a given tonsil was causing trouble or not. Granted that the patient is thus referred to him for opinion, he would, in positive cases, always operate. In doubtful cases, especially when there is a good fee in sight, he could likewise be counted on to do his operation duty. But in a goodly number he would assure the patient and the consultant that the gentle attentions of the knife and guillotine might be dispensed with. He would often readily discover that the source of the rheumatic infection was somewhere else in his department and the therapy could be placed on an exact basis. This would seem surely ever so much to be desired when we think of the seriousness of the operation of tonsillectomy as it sometimes turns out.

After all, is it not the viewpoint of the beginner and the uninformed that we would seek to make more conclusive and clear? This audience does not need instructing; still less from me. But true to our motto, while making a clear picture for others, teaching, we may discover a different, broader view for ourselves. It is perhaps this in the background of my mind which makes me feel that this harangue is at all worth while. If any one of the gentlemen making up this noble body of men known as the American Laryngological Association felt that it was wise to enucleate any given pair of tonsils, there is no doubt as to the results. It would be neatly and safely done.

But it is the impression that we give, or that we have recently given, perhaps, that all tonsils are to be enucleated if operated upon at all, and that no other way exists of meeting the indication, which is having a very bad effect upon the young, ardent, and ignorant operator. Tonsillotomy, the good old-fashioned slicing off of the projecting tonsil, was the first and most frequently done operation by the beginner in the days just gone by. The young operator of today, following the inherited instincts of his profession, feels likewise perfectly competent to do an enucleation as one of the first things that he attempts, and I do not think it is safe. Much mischief has been done, and looking upon it in the mouths of young men from all over the country, I am sometimes appalled. I often see the work of you gentlemen, the best in the country, and to judge by some other postoperative results, I must see some of the worst work in the country. Presumably, in the case of most students who come to Yale, the best talent obtainable in any given locality would be the one which the intelligent and well-to-do families represented would naturally have employed. If to men who are especially qualified, such accidents happen as occasionally do and as I myself have seen, what must be the result when inexperienced and unskilled men take the lives of their patients in hand as they seek to imitate what they think we by our example have taught them? This carelessness or thoughtlessness on our part, if such really is the case, must surely arise from a certain bit of indifference on our part, perhaps due to a faulty conception of the conditions.

Until very recent years we have always been brought up to believe that the tonsils have no lymphatic vessels leading into them. It was a long time before it was at all conceded that they really are what they are, an important part of the lymphatic system. Even after the serious admission of that point it was still believed that, whereas lymphatic vessels led from the tonsils into the deeper lying structures in the neck connected with other lymph nodes and by virtue of well established channels communicated directly with the deeper lying nodes as far down as into the interior of the chest, to say nothing of the connection through the thoracic duct with the circulation of the blood proper, still, we failed to think of anything entering the tonsils other than through their surface. Astonishingly different views are now being brought to our attention, and if we are at all alert to our duty, we must at least give them serious and proper consideration. If we do this, I feel confident that there will be a gradual change of view to a proper level. The pendulum has swung so far toward radicalism that it must soon revert to a more conservative position which will be nearer the line of truth.

For years we have clinically known what has been called especially to our attention by many observers in written publications, and rather prominently by Fraenkel, of Berlin, that in the presence of acute coryza quite notably, sometimes following cauterization of the nose, as a result of difficult eruption of wisdom teeth in the adult, and even sometimes as a result of an inflammation of the nasopharynx and lateral columns, a tonsillitis has supervened. Of course it is purely a secondary process as we could easily observe clinically. For years the fact was impressed upon me that if I could get children past the sixth or seventh year without doing the then universal clipping tonsillotomy, the child would seem to grow out of the necessity for these operations and would go on to the developing of a perfectly healthy, normal individual. Sometimes the indications seemed to be absolutely certain and conclusive that operation was necessary, and for some reason or other it was deferred, not from any advice of mine but because of circumstances which supervened, and the necessity passed by; the tonsils shrunk, the adenoid retreated, and the patient grew and waxed strong. All of these observations had been clinically thoroughly and frequently observed, but it had not occurred to me to attribute the cause to any given source. Especially the last suggestion as to the child from six to eight years. I had been at a loss to account for the observation in any intelligent way until I read a paper[1] by Dr. George H. Wright, of Boston, where he describes a certain functional relation of the tonsil to the teeth, and wherein he attributes quite properly the cause of the enlargement of the faucial tonsils especially, not merely the lymph nodes in the neck but the faucial tonsils themselves, to the changes in the nutrition of the parts necessary to the proper eruption of the teeth and often resulting from their improper general care. He reported a record of 150 cases where operations on the tonsils have been deferred, awaiting eruption of the molars, not only in the six year period but in the twelve year period, and when the dentition had been completely accomplished the glands in the neck went down and with them also the tonsils. He suggested the rather ingenious idea that the cervical lymph nodes, in trying to take care of the products of tissue change and tissue formation, being a bit overworked and being unable to do the duty devolving upon them, that, so to speak, certain of the products were pushed back into the lymphatic vessels leading to the tonsils, and that the tonsils themselves enlarged as a result of thus trying not only to do their own work (allowing they had any), but also that which was thus forced back upon them. He apparently proves this by the fact that he has observed so frequently that he feels sure they must be correctly correlated; that when the teeth are properly put in order and the dentition over the tonsil again recedes without further or other treatment.

Ashurst[2] goes a step further and calls the tonsils even eliminating organs and as the result of cases observed by him thought the sequence of it occurred as follows: First the patient had a cold in the head, then swelling of the glands back of or under the sternocleidomastoid muscle, then finally inflammation of the faucial tonsils, this last swelling being apparent after the glands at the angle of the jaw had begun to swell. His deduction was that the rheumatic manifestation which was present in the tonsils was due to the effort of the tonsils to eliminate that which was forced in upon them. The theory of Wright and his own in a way very closely approximate one another.

Now is there any evidence of a more strictly anatomic or scientific nature which would explain these points? Von Lenart[3], in a number of different animals, very conclusively, carefully, and definitely proved that there were lymphatic vessels leading into the tonsil, i. e., that the tonsil was just like all other lymph nodes, had afferent and efferent vessels. Not that he was the only one to observe this, but he deserves special mention by virtue of his careful experiments on animals of various types. He proved, for example, that inert coloring matter injected into the nasal mucous membrane on one side would not only be found in the tonsil of that side, after a proper length of time, but would also be found in the tonsil of the opposite side, showing that there is a free anastomosis of the vessels of the two sides, and that septic or other matter present in the nose can find a direct channel for passage into the tonsil. This explains, to my mind, all of the varying conditions and clinical phenomena which we have, in the last few paragraphs, referred to. We do not need to ring in either of the ingenious theories of Wright or of Ashurst. Nor need we like Schoenemann[4] think the tonsils always to be secondarily affected from the nose, but we must admit that it sometimes may be the case.

If one follows the lymphatic channels, as is shown by the work of Gruenwald[5], even from the accessory sinuses, they will be found to converge into the larger vessels which collect in the region above the soft palate directly over the vessels which must lead into the tonsil, and hence even from the accessory sinuses, matter may land in the tonsil proper. From the teeth themselves, and from any disease of the alveolar process of the palate, therefore, the direct absorption carries that material into the tonsils proper, as well as into the other nodes of the neck, so that the tonsil may not be having work forced back upon it, but is really getting the work at first hand. Also, this knowledge of the lymphatic vessels going directly into the tonsils would very readily explain the observations of Ashurst, which I have happened to see duplicated three or four times within the last year, how the tonsil was directly infected by other portions of the nasal tract.

.This also applies very appropriately to the question of tuberculosis. I have on a number of different occasions expressed my belief that the tonsils were only one of very many sources of probable absorption of the tubercle bacillus, as from points in the nose, and particularly in the nasopharynx and lateral columns, and now that it is possible to believe that matter may go from the nose, diseased gums, or alveolar process directly to the tonsil, I am firmly of the belief that some of the cases where tonsils, after removal, have been found to include in their interiors tubercle bacilli, the tonsils themselves are merely doing the work that any other lymph gland does; that when the tubercle bacilli enter it, the effort is always made to retain them there, dispose of them if possible, and thus not allow them to go further and deeper into the interior, and that these same bacilli came by way of the afferent lymphatics to the tonsils and not through their buccal surfaces.

I want again to voice my surprise that the general surgeon is often so active and so thoughtless in his removal of lymph nodes. The custom as usually carried out would seem to be that if one is to remove tubercular lymph glands, as from the neck, of any patient, not only to remove those that are visibly and evidently enlarged and diseased, but to take out every gland that is visible and even palpable. If, however, one has removed all the nodes, as is, and sometimes must be, done in some of these radical operations upon the neck, so that both the superficial and deep nodes are pretty thoroughly cleaned out, what protection has that patient from absorption from anywhere within the upper air tract? If the lymph glands are supposed to purify the lymph from, and to obstruct the progress of deleterious matter toward the deeper and more vital portions of the body, if these protectors are all removed, what is there left to prevent germs that are absorbed from going directly down into the thorax and deeper lying organs? And if you add to the above the removal of the tonsil, another of the protecting lymph nodes, when matter is absorbed into the lymph channels lying higher up, is there not bound to be some obvious result of this state of things? The natural inference would be that certain forms of tuberculosis would be more frequent, just from all this surgical activity, if for no other cause, and I have been rather expecting to hear it from some source. If any of the contentions which will later be brought forward as the obvious corollary of some of the observations herein stated are at all reasonable, we shall in the next ten or fifteen years discover that certain things will result, and the first statement which I have heard of anything of the kind that seems to be in line with the above is that of Dr. E. Hermann Arnold, of my town. He feels confident that bone tuberculosis, especially in children who have had their cervical lymph nodes generously removed, is more frequent than it ever used to be. I believe that his observation will certainly be duplicated by that of others.

The only possibility which allows one to escape from the logic of what has just been presented, viz., that if you remove a lymph node, you remove one of the guard which is protecting from the invasion of germs and infected material, and every one removed is one less to help and protect (and the tonsil now, in view of well ascertained facts, has to be put into the same category as any and every other lymph node, and that when it is completely removed for other causes than absolute inherent disease, a definite force for good has been taken from us)—the only way we can avoid the logic of this, I say, is to definitely state that we are all wrong as regards the office of the lymph node, and this is untenable.

Did one desire to have any further proof of the extreme probability that the tonsil is to all intents and purposes a lymph node, all that is necessary is to look at a microscopic section of a cervical lymph node and one from one of the beautifully artistic results of the modern tonsillectomy, both prepared in the same way. The arrangement of the hilus and body of the gland may vary a bit, the embryologic origin is somewhat different, but the picture, when looked upon in a general sort of way, is so evidently similar that one could not for a moment believe that the functions of the two could greatly differ.

I cannot sympathize much with the viewpoint that the tonsil has an internal secretion, other than the fact that it may contribute lymphocytes to the general circulation as do all other lymph glands, but until it is generally proved that other lymph glands have an internal secretion, I am not prepared to admit that the tonsil itself has.

The question arises, how much of its enlargement is surely like that of other cervical nodes, i. e., one for which it is itself not at all to blame? It enlarges, presumably, in performance of its function, and its function is not wholly to absorb through its surface. In fact, it may do exactly as Ashurst suggests; it may try actually to eliminate. Brieger and Goerke have expressed their belief in their so-called Durch-Stroemungstheorie, which is to the effect that there is a constant flow of lymph from the interior of the tonsil through to its surface, and not only that leucocytes and lymphocytes occasionally wander through to the surface, but that there is an actual fluid outflow through the interstices of the epithelium, exactly as there is in the nose through the interstices in the nasal epithelium, and this outflow especially protects in the case of the tonsils from the influx of the germs from the surface and that the impurities are thus washed to the surface and carried out and swallowed. Only when this flow ceases, owing to internal or local conditions, could infection take place. This I am not prepared either to accept or condemn, but it certainly shows that other functions are to be conceived than that of merely soaking up from the surface as does a sponge, which has been all that has ever been credited to the tonsil in the older ideas.

O. Levenstein, of Berlin, who is associated with Fraenkel in the Berlin Policlinic, has done as much individual work and spent as much thought on the question of the function of the tonsil as anyone whom I have been able to discover in recent literature. Certainly, he has a right to state almost ex cathedra a definite opinion. After a review of all the theories that have been advanced, the protective, the absorptive, the Durch-Stroemungstheorie, the theory that it possesses a function, as suggested by the experiments of our own George B. Wood, of contributing largely to the production of white corpuscles from its epithelium, that all adenoid tissue has this function, after giving all credit to the ideas exploited by all authors, ends up with the confession that he feels that every one and all of them fall short of expressing definitely what the function of the tonsils is. He leaves you entirely, in a way, without a leg to stand upon; finding evidence which seems to contradict that any one of these theories is the sole function of the tonsil. In this last I believe that he is right. I believe that no one single thing explains what the tonsil does. It may do all of them, but I think we can safely assume that it is absolutely, in every sense and in all senses, a lymph node, and as such should be protected from rude destruction. Whatever its humble office may be, it had better be allowed to perform it; if not, some other deeper lying node has got to do it. And when this deeper node does, by any chance, protect from an invader which the removed tonsil should have held up, the septic matter is nearer the more vital portions of the body by having gotten beyond the first barricade. This idea certainly comes comfortably to my support in the conservatism which I have always exercised in the treatment of tonsils in the adult. I have for years in them followed out the practice suggested by what I did for the Vassar student, freeing the pillars of the palate, slitting up the crypts which burrow and underlie the surface, getting rid of all retention spots, and shrinking the tonsil by ignipuncture. If very large, naturally, diminishing the size by punch forceps or by removing the larger portions by scissors or guillotine, but rarely tonsillectomizing. I feel that I have been able to do for my patients, safely, comfortably and thoroughly, all that has been done by the other methods. I trust that I may be understood that in this respect I am speaking of routine procedures. When I believe a tonsil is thoroughly diseased I presume no one of you is more thorough in removing it than am I, but it is only when I think it is thoroughly diseased that I have done so. The chief dependence for the shrinking other than by the occasional clipping has been the galvanocautery ignipuncture method. Each of us has our habits, as I have said before in this paper, and this has been mine.

It has been with peculiar pleasure that I have read Levinstein's article in the last number of *Fraenkel's Archives,* where he, from entirely independent observations carried out carefully and for years, comes forward with the plea that it is often unnecessary to do anything more than to thoroughly slit up and shrink the upper lobe of the tonsil. He quite truthfully insists that by far the most frequent source of the quinsies from which people suffer is the upper lobe of the mass. If this is properly freed and opened and taken care of, that is all that is necessary in a great many cases. In his usual thorough way he goes at great length to explain and justify the position which he has in a way empirically and clinically observed to be perfectly true, and it is with singular pleasure that I in my humble way speak in confirmation of what he has said and claimed. As he wisely says, if there be any function to be attributed to the tonsil, you at least leave a large enough portion of the tonsil behind, in this way, so that it can readily perform its duties.

Now, if there is any wheat amidst all this chaff so cheerfully borne by you in its tedious presentment, it must be this, that as to the young the lymphatic system is a necessity, we should let the young have all of it, unless removal of any portion of it is necessary because of disease. If at any time of life tonsillectomy is to be criticized, it is in the young child under six or ten, and my plea which might at this junction be termed a wail, is that by everything logical we ought to refrain from the beautiful and satisfying operation of tonsillectomy, as a routine procedure in our clinics, until after the tenth year, unless for known disease.

Healthy, normal adenoid and tonsil tissue is formed before birth and increases for a certain time, and afterwards shrinks and disappears, just as does the thymus gland. The really ideal normal child always has his tonsils, and, like all our organs, they do their work without our being conscious of them while they remain normal. This surely, then, suggests a certain stated function.

Apparently the first part of the ring of adenoid tissue in our throats to possess a function is the pharynx tonsil. Later, when dentition starts, the faucials show activity; and later still the lingual tonsil. When retrograde processes start the atrophy first shows in the adenoid, and later still the faucials start to shrink. At forty the lingual tonsil may be still active. This suggests that a certain amount of activity of this tissue is all our life long necessary for the proper wellbeing of our bodies. Now, why should we thus ruthlessly remove in childhood all of that tissue which we can lay our hands upon, when all the logic of events is that some of it is surely needed? Have you not all of you contemplated how much this sometimes is when you have done a complete adenoidectomy and a pretty enucleation? It seems so satisfying, and one sort of pats himself on the back, as he contemplates how every bit of the tonsils is there, all within its capsule.

It would seem logical that we cannot do this indefinitely to young children without some penalty, and I feel positive that in ten or fifteen years from now we will all know what it is that we have done. Without doubt some of the little folks from whom we have removed so much tissue are going to need more than they have left. Then we might expect early enlargement of the lingual tonsil, and the lateral columns of the pharynx will be found projecting into the throat, and no doubt by their clinical manifestations will give us still something to do when there are no more tonsils to enucleate.

Already, as a sign of the times, I might chronicle the fact that I have this year seen my first three cases of quinsy of the lateral columns of the pharynx. Each was a well defined abscess just above and behind the palate, and each of them was associated with profound systemic disturbance and marked and very threatening edema glottidis. In two of the patients only rudimentary tonsils existed, one having had two operations on his tonsils.

Living as I do in a small community, I see more of my successes and failures than do many of you in the larger cities, who never surely know very much of what happens to the hundreds and thousands of your clinic patients. The greater the city, the less you can follow even your private patients. For years I removed only adenoids in an attempt to study the problem, in children rarely doing even a radical tonsillotomy unless the tonsils were either diseased or markedly obstructive. What has been the result? A varied one, as might have been expected. Some faucials enlarged; some did not. But some took better care of their throats and teeth. Some had better noses. Some did not need the tissue, and others did. Those who did, many of them, never had the slightest trouble from the tonsils which enlarged in response to needs of the system for tissue of that kind. The large, discrete tonsils were without symptoms. Only the adherent, sunken ones ever made any trouble. When the children got older, the discrete but sometimes too large tonsils shrank away, and nothing ever happened. I have only a very few times, remarkably few, ever had the slightest reason to wish I had removed more: when I did, the children were old enough so that a little shrinkage by ignipuncture was all that was necessary. And if this tonsil tissue was any protection, then they surely had all such advantages.

It might now be asked, when we suddenly remove these large amounts of adenoid tissue from our small patients, why don't we observe some bad results, if this is so disastrous to them? This I have already said I believe will surely be chronicled if all of us, in a perfectly judicial spirit, observe while we watch and wait. What the function of the tonsil is must soon be learned if all that we have said has any bearing. It is rather suggestive, and I have often wondered if there is any connection between the frequently observed appendicitis in children who have had both tonsils and adenoids thoroughly removed. Both are certainly adenoid structures. Much more has been said about the appendix, also, since the arrival of grippe in our land. And here, too, I have wondered if the grippe is not also responsible for sending astray from the straight and narrow path of normal procedure many a tonsil and adenoid. Might they not have grown big from trying to defend our systems from the grippe inroads?

By thinking along all the various lines, I believe we shall be able to deduce, as I have said before, something interesting and instructive.

In conclusion I want to commend the following thoughts as being perhaps more applicable to the younger generation who are to follow us to the front ranks of the workers in this line of activity:

First, that logically tonsil tissue must have a function, and if so, it is to the young that it is of most value.

Second, if it is necessary to operate in children upon the faucial tonsils which are merely large and not diseased, then there are surely perfectly safe, sane, and effective methods other than complete tonsillectomy to deal with the problem. Be thorough with the adenoids, but save some healthy tonsil tissue.

Third, while what has just preceded may apply perfectly well to adults, in them the evidences of disease may be so apparent that radical procedure against the tonsil is surely justifiable; and then, by all means, do a tonsillectomy, in any one of the admirable ways which you gentlemen have been so prominently identified in developing to a perfect detail.

232 York Street.

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XLI.

THE TECHNIC OF TONSILLECTOMY.

By J. M. Ingersoll, M. D.,

Cleveland.

A few years ago, when the complete enucleation of the tonsils began to be generally advocated as the best method of treating pathologic conditions of the tonsils, we tried in our dispensary at Lakeside Hospital the various operations advised by different men and gradually evolved the following operative technic:

Ether is used for the anesthetic and enough is given to completely relax the muscles of the jaws. Then a self-retaining mouth gag (Whitehead's) is placed in the patient's mouth and the patient is moved along on the table so that the head hangs freely over the end. One assistant sits on the left and holds the head firmly with both hands, turning it slightly to the patient's left side when the left tonsil is being operated upon, and vice versa for the right tonsil.

A second assistant stands on the patient's right side, holds the tongue depressor with his left hand and sponges with his right. A fairly broad, flat tongue depressor is used, its distal end being bent downward slightly so that it can be hooked down back of the tongue and thus pull the tongue forward as well as depress it. The operator sits at the end of the table with the patient's head directly in front of him so that the relative position of each tonsil is the same. If daylight is used, the operator's back should be toward the window.

One tonsil is grasped with a pair of forceps and pulled forward and inward toward the median line. Then the mucous membrane over the superior part of the tonsil just in front of the anterior pillar is cut with a pair of scissors.

This primary incision should be carefully made through the mucous membrane only. When the incision extends down into the tonsillar tissue the tonsil itself is more liable to tear and the dissection becomes difficult or almost impossible. Usually the glistening capsule of the tonsil can be seen through the primary incision. A blunt dissector is inserted behind the capsule, and the velar lobe of the tonsil is freed from its attachment to the anterior and posterior pillars and the surrounding tissue. If the blunt dissector does not separate the tonsil from the surrounding tissue when moderate force is used, then the firmer attachments are severed with the scissors. In this way the tonsil with its capsule is dissected entirely free from the anterior and posterior pillars and from its attachment superiorly and somewhat inferiorly.

A considerable part of the successful enucleation of the tonsil depends upon the careful dissection of the superior portion of the tonsil and its capsule. When the dissection is complete the tonsil should be so free that it can be easily drawn out beyond the faucial pillars.

The wire loop of a Tyding's snare is placed over the tonsil, which is then grasped with the forceps, one blade in the supratonsillar fossa and the other in the inferior part of the tonsil, and pulled forward so that the whole tonsil extends through the loop. It almost goes without saying that caution should be used to see that the uvula is not caught in the snare. The snare is closed slowly, and it naturally follows the line of least resistance—namely, the attachment of the capsule to the surrounding tissue—and the tonsil with its capsule is shelled out from the tonsillar fossa.

A gauze sponge is then packed into the fossa and held in position for two or three minutes by firm pressure with the index finger while more anesthetic is being given if it is needed. This firm pressure usually stops the bleeding, and when the sponge is removed the fossa is carefully inspected. If there are any bleeding points they are grasped with ordinary hemostats and twisted. If an artery large enough to spurt has been cut, it is grasped and a buried catgut ligature is passed around it and tied tightly. We have found that unless the ligature is anchored in the tissue around the artery, it is liable to slip off and cause secondary hemorrhage. In other words, tonsillar hemorrhage is dealt with in exactly the same way as hemorrhage in any surgical operation and is controlled by pressure, torsion or ligation.

The second tonsil is then operated upon in the same way, and when the hemorrhage in each fossa has been completely stopped an adenotomy is done, if necessary.

The patient is kept in bed three days and is given soft or liquid diet. The only after-treatment is an alkaline mouth wash. Sprays, gargles and local applications are contraindicated.

The operation is always done at a hospital or under favorable circumstances at the patient's home. Ether is used for the anesthetic in adults, as well as in children, for it has been our experience that there is more liability of considerable hemorrhage in an adult than in a child, and the hemorrhage can be more easily controlled under general than under local anesthesia.

We do not claim any particular originality for this method of operating. The position of the patient has been fully described before and is known as the Rose position. This position offers some decided advantages over the other positions commonly used. It is equally good for the use of direct or reflected light. The relative position of each tonsil is the same. The blood tends to gravitate into the nasopharynx, away from the field of operation, and is less liable to be inspired. The operative field can easily be sponged and kept clean by an assistant. Severe hemorrhage can be more accurately observed and efficiently controlled.

The various steps in the operation are the same as or similar to those of other men. We think that a cleaner and better dissection of the tonsil can be made with an instrument devised for this purpose than with the finger. Our method of dealing with hemorrhage is, as far as we know, somewhat different from that of most operators. In our experience it has been very efficient. The average time necessary for the operation is from eight to twelve minutes in uncomplicated cases. The time needed to anesthetize the patient varies greatly and is usually more than the time used in the operation.

XLII.

THE RELATION OF ENLARGED TONSILS TO ENDOCARDITIS.

By Albert C. Getchell, M. D.,

Worcester, Mass.

In the Transactions of the Association of American Physicians for the year 1899 is a paper entitled "Endocarditis Occurring in the Course of Tonsillitis," by Dr. F. A. Packard. While the writer was guarded as to his conclusions, yet the paper stands as a definite exposition of the relationship of tonsillitis and endocarditis, and has been so quoted by other writers from time to time. The question Dr. Packard discussed was a pathologic one, but with the growth of the operation for the complete removal of the tonsil it has become also a practical one. For if so serious a malady as endocarditis depends to any considerable degree upon the presence in tonsils of a causative agent, any operation, however difficult or dangerous, is not only proper but necessary.

There is no question that among throat specialists in the United States there has of late years been a growing feeling of the importance of the tonsils as the portals of entry for the infection of many serious diseases, and one finds this idea gaining ground among the profession at large.

Looking over the literature of the subject among writers on diseases of the heart and diseases of children, I find this view rather cautiously stated by some, while others make no mention of it whatever. Thus, not to attempt an exhaustive list but by way of illustration, Whittaker in "The Twentieth Century of Practice," 1895, Vol. IV, p. 156, says: "The tendency of modern belief is to regard the throat as the avenue of entrance for the microorganisms of rheumatism and endocarditis." Haig-Brown found conclusive evidence of endocarditis in 8 out of 345 cases of tonsillitis. These and other quotations may be found in Packard's article. Babcock in his book on the heart, page 156, says: "It (endocarditis) has been known to follow tonsillitis and so apparently a local process as furuncle." Holt says (edition of 1910, p. 1140): "Acute tonsillitis often ushers in an attack of rheumatic arthritis, and occasionally acute endocarditis."

The most recent book on diseases of the heart that I have consulted, James Mackenzie, makes no mention of the matter. And also Edmund Cautley, in his "Diseases of Infants and Children," just published, makes no mention of the relationship.

On the other hand, Osler in the article on endocarditis, which he writes in his recent "System of Medicine," speaks in no uncertain terms. He says (Vol. IV, p. 138):

"The tonsils, the mycotic hot beds, are responsible for a great many cases, and if as is now commonly believed the infection of acute rheumatic fever is here nurtured, they take the first rank as sources of infection."

Again, page 139:

"The so-called endocarditis from cold is probably always rheumatic, and of tonsillar origin, and it may occur in the febrile attacks of children as the result of slight or even overlooked tonsillitis."

And again, page 149:

"Much could be done to lessen the number of cases of rheumatic fever, of chorea, and of endocarditis if we attacked more vigorously and more systematically the enlarged tonsils of children. Here is the point toward which our efforts should be directed. A child subject to recurring attacks of tonsillitis or with marked adenoids should have the tonsils or adenoids thoroughly removed. Other measures of local treatment simply trifle with that what is always a very dangerous condition."

Here the question with which this inquiry started is answered, positively, almost dogmatically, by an eminent authority. The tonsils of a child subject to recurring attacks of tonsillitis are dangerous structures, whose complete and thorough removal is demanded to save the child from so serious a disease as endocarditis. It seems to me, however, that even this does not settle the question, but that further study of the problem is needed. I used to think that the relation of tonsillitis—or rather, to be more specific, the relation of chronically enlarged tonsils to endocarditis was a very definite one. For the last four or five years, however, I have been studying more carefully the cases of enlarged tonsils and adenoids that have come to me for operation, and I do not feel that the causative relation is so definite as I once did.

I have had continuous charge of the throat department at the Memorial Hospital in Worcester for nineteen years. In that time there have been somewhat over 2,000 tonsil operations. Until recently I have done all the operating myself. For the last few years my assistants have done a good deal, but I still exercise close supervision over the work, operating myself one day in the week. For safety of anesthesia it has always been our custom to examine with bare chest the heart and lungs of patients before operation, and if the house physician finds anything abnormal, the matter is brought to the attention of the operating surgeon. These cases include boys and girls up to the age of 16 and adult women. Since I have begun to pay especial attention to the matter, I have been struck with the extreme rarity of heart lesions.

I can recall but one case of undoubted cardiac disease. Of this case I shall speak later. And so of all the cases that have come under my observation in this hospital, in private practice and in other hospntals, while I have found definite cardiac lesions in persons who came for the removal of enlarged tonsils, yet these cases are so few that the complication in my experience is one of great rarity. If, then, enlarged tonsils, which have been subject to recurring attacks of inflammation, are so definite a cause of endocarditis, why should evidence of endocardial trouble in these patients be not only not the rule but the rare exception?

I desire now to cite the case I referred to a few moments ago. It was a boy of 14, with well marked heart disease—enlargement, thrill, apex systolic murmur transmitted to the axilla and heard plainly in the back. He had very large tonsils, and was referred to me for removal of them on account of his heart trouble. At first sight it seemed to be a case where there was a direct relation between enlarged tonsils as such and endocarditis, and so the doctor thought who referred the case. On careful inquiry, however, I found that this was not so. This boy, so far as he and his mother knew, had never had sore throats, and up to two years ago was always well. Then he was ill with diphtheria, and was at the Isolation Hospital. Since then he has not been so well, and has had to call a doctor from time to time. When he was at Isolation Hospital no note was made of any heart trouble. It is hardly possible that a heart like his could have escaped detection in this well conducted hospital. It is, therefore, plain that his endocardial trouble developed after his diphtheria, and probably as a result of it. His tonsils were removed and examined by a pathologist. They were simply hypertrophied tonsils.

Before much can be gained in settlement of this question, we must have definite ideas of what we mean by endocarditis. Is the pathologic process limited to the lining membrane of the heart, or does it involve to a greater or less extent the heart muscle? If the former, the lesion is much more serious than the latter, for the mechanism of the heart is permanently damaged, by alteration in the structure of the valves. On the other hand, if the lesion which causes the murmur is due to myocardial change and dilatation of the orifices, this condition may be temporary and the heart may later recover its perfect power.

Osler says (op. cit., p. 134): "Infective endocarditis is a valvular, rarely a mural lesion." But later on (p. 136): "In addition to changes in the endocardium there are usually alterations in the myocardium," and (p. 145) "Sturgis very correctly insisted that a majority of the cases are best described as carditis, so frequently are the epicardium and the substance of the heart involved."

Mackenzie (p. 215) says: "One must consider carefully the murmurs arising in the course of a febrile attack, even in rheumatic fever, for the presence of a murmur may not necessarily mean the invasion of the mitral valves by the inflammatory process, but may be due to the tonicity of the poisoned heart muscle failing and giving rise to incompetence of the mitral orifice, due therefore not to endocardial, but to a myocardial affection. Endocarditis and pericarditis, both acute and chronic, bulk so largely in medical literature, only because an abnormal sound invariably impresses the mind more than an abnormal sign perceptible by other senses, and the easy recognition of a valvular murmur and friction sound has led to the associated symptoms being ascribed to the same lesion."

(See also Thayer "On the Commoner Types of Functional

Cardiac Murmurs," Transactions of the Association of American Physicians, Vol. XXV, p. 75.)

Will not these considerations account for the fact that if children are carefully examined a murmur may be found and a diagnosis of endocarditis made, while later in life this same person may apply for removal of the tonsils and no cardiac lesion be found? This may happen peculiarly in children, in whom a cardiac abnormality may develop without being accompanied by evident symptoms.

This is a case in point: A young girl upon whom I operated last summer for the removal of tonsils. About once a year she had had attacks of tonsillitis. Her parents were people who never hesitated to call the family physician, a careful and competent man. A cardiac murmur was accidentally found in the examination of the gymnasium physician, its existence or heart trouble not having been suspected.

Tonsillitis is common in childhood. Osler says: "Tonsillar infection is universal in childhood." Is acute endocarditis proportionally common then? Gibson, "Diseases of the Heart and Aorta," 1898, page 393, says: "Acute endocarditis is essentially a disease of the active period of adult life, its occurrence being most frequent between the age of twenty and forty." To finish Osler's remark just quoted: "Tonsillar infection is universal in childhood, while rheumatic infection although common only occurs in a comparatively small number of children" (p. 139). Julius Derschfeld says (Allbult's System, Vol. 1, p. 630: "Infective endocarditis occurs between 20 and 40. It is rare in children according to Osler, although he (Derschfeld) thinks it is not so rare."

The diseases which are supposed to cause endocarditis are scarlet fever, measles, smallpox, influenza, erysipelas, pneumonia, pyemia, gonorrhea, tuberculosis, rheumatism, otitis, diseases of the vagina and uterus, empyemia (Gibson).

Researches demonstrate conclusively the invasion of the heart by the specific organisms of rheumatic fever, pneumonia, typhoid fever, diphtheria, erysipelas, influenza and various septic infections. (Mackenzie, page 214.)

Whittaker ("Twentieth Century Practice," page 156) gives in addition to those already mentioned, osteomyelitis and periostitis, furunculosis, dysentery, malaria, and says: "It is universally admitted that even the most trivial infection may be followed by endocarditis. Thus endocarditis has been observed after infections as inconsiderable as quinsy and mumps." That is to say, many, probably all the general diseases which are due to a microorganism, may produce heart disease. Of these, rheumatism, in all probability a germ disease, is more liable to cause heart infection, which locates on the valves. It is true also that other infections, more likely to be local than general, may produce the same result, such as septic infections. The mouth, being the opening of the body most accessible, it seems that the point of entrance of the infecting agent would be there, and it is undoubtedly true that it is in many instances. Moreover, if the structures in the mouth are inflamed or diseased, resistance is lowered, and infection is more liable to take place. In this way chronically enlarged and inflamed tonsils would, and undoubtedly do, make the throat more liable to infection. But it does not follow that the tonsils themselves are the necessary and sole foci of infection. Thus, a careful reading of Packard's five cases shows that in only one of them were there swollen and inflamed tonsils, that is, a typically acute tonsillitis. One of the cases had a slightly inflamed tonsil with an enlarged cervical lymph node of the same side. The second had a mild angina with catarrhal inflammation of the pharynx. The third had greatly enlarged and acutely inflamed tonsils. The fourth had pain in swallowing, and on examination the mucous membrane of the fauces and pharynx was found to be swollen and reddened, and the submaxillary lymph nodes were plainly enlarged. The fifth had a slight sore throat, and Dr. Packard's services were called because of a glandular swelling on the neck a few days later. I quote these cases thus fully because this paper has been so often referred to. It is evident that there was in all these cases an infection of the throat, but it is not evident that the tonsils were in all of them either the cause or the avenue of the infection.

Sore throats,—anginas as they used to be called,—even in children, are not all due to inflammation of the tonsils. They are very often due to an inflammation of the glandular tissue of the pharynx, even an infection with a deposit simulating diphtheria starting here.

I have under observation now an adult, a nurse in a hospital, whose tonsils I removed, with the main intent to put a stop to infective sore throats. The tonsils were thoroughly removed, but she has had the sore throats which excite suspicion of diphtheria as she did before, and she tells me of a friend who has a similar experience.

In adults a not uncommon cause of a sore throat is an inflammation of the lateral columns of the pharynx. The pain and other symptoms in this variety of sore throat simulate tonsillitis, and might very well be called tonsillitis by practitioners not accustomed to carefully inspect the throat with a good light. So that we should be cautious in concluding from the mere fact of sequence of sore throat and endocardial symptoms that the initial disease was tonsillitis. But, if in a certain number of cases the sore throat is due to tonsillitis, and endocarditis follows this sore throat, the question still remains, were the tonsils the accidental or the essential foci of infection?

The question here is not, does endocarditis follow in a considerable number of cases attacks of tonsillitis, especially in persons who have rheumatism, which clinically seems well established; but does the enlarged tonsil, by and of itself, contain the infecting agent likely to produce the disease? If this is so, endocarditis associated with enlarged tonsils should occur most frequently in the period of life when tonsillar inflammation is most common, which it does not, and persons having enlarged tonsils should show not rarely but frequently signs of endocarditis, which in my experience is not true.

An answer to this question should be found in the study of the bacteria of infective endocarditis and of the bacteria of the tonsils. It would seem from the studies of Libman and Cellar ("Observations on the Etiology of Subacute Infective Endocarditis," Transactions of Association of American Physicians, Vol. 25, p. 5) that we are getting to a definite knowledge on this subject. The next step will be to study the bacteria of the tonsils, and see if they correspond to those found in the cardiac lesions, and if they may be made to produce endocarditis experimentally. This Dr. David J. Davis of Chicago has done. He has reported upon this work in a short communication in the *Journal of the American Medical Association* for July 2, 1910, page 26. This report and a personal letter from him indicate that our knowledge of the bacteriology of the tonsils is very imperfect and inadequate; that the whole subject must be gone over again and newer methods employed. He finds his own work far from conclusive, and at present states only facts, refraining from any general conclusion. He finds that the bacteria of the crypts are of one kind, and those of the surface another. The bacteria of the crypts injected into rabbits intravenously, almost invariably localized in the joints and tendon sheaths, but they in no case produced endocarditis. On the other hand, in one instance he succeeded in producing endocarditis with an injection of the surface bacteria. These bacteria he cautiously concludes are the same that have been found in the blood in cases of chronic infective endocarditis by Rosenow and others.

To make a general statement, so far as one can be made at this time: the tonsils, lying as they do in the outer portals or vestibule of the digestive and respiratory tracts, are organs upon which certain bacteria lodge, and the infection of the tonsils with the bacteria cause an inflammation of the tonsils, and later within the system these same bacteria may cause an inflammation of the heart. Hence the sequence in time of tonsillitis of endocarditis. But the tonsils are the accidental and not the essential agents in this infection.

Early in this paper I said that its object is a practical one. It is this: So far as enlarged tonsils have a relation to endocarditis, when is the operation for their removal indicated, and what kind of an operation should be done? Before answering this question it may be well to review briefly the present status of opinion on these two points in reference to the general question of tonsil operations.

In a recent paper by Guy L. Hunner, on "Chronic Urethritis and Chronic Uteritis Caused by Tonsillitis" (*Journal of the American Medical Association,* April 1, 1911, p. 937) the following paragraph may be found:

"In a comparatively recent paper Rosenheimer has reviewed the literature and found the following list of ailments ascribed in certain cases to tonsillar infection: aneurysm, appendicitis, erysipelas, and a number of other skin manifestations, meningitis, iritis, pleuritis, pericarditis, pneumonia, paraplegia and strabismus, parotitis, nephritis, osteomyelitis, phlegmon of the lower extremities, oophoritis and orchitis, septicemia, typhoid beginning with an angina, and tuberculosis."

We are told by reputable men that at the base of innocent looking tonsils lie foci of disease, and that every particle of tonsillar tissue should be removed to prevent serious systemic disease.

The character and type of operation generally practiced now may be inferred from the instruments used. I counted in a recent instrument catalogue 64 varieties of tonsil knives, many sharp and pointed.

At one of our best medical schools recently I saw a child brought before the class for operation. The child was profoundly etherized and put in the upright position, and the instructor told the class that the present method of operation required the complete etherization, and that nothing else would do. The tonsils were then removed by the dissection method.

In a recent paper (*Boston Medical and Surgical Journal*, Vol. 164, No. 12, p. 415) Dr. E. A. Crockett says: "Twelve deaths have occurred in and about Boston in the last two years following the removal of tonsils, besides a large number of considerable hemorrhages that would have been fatal unless checked by experienced hands." Is it not time to pause and ask if the operation for the removal of tonsils as at present practiced is necessary, and if this toll of mortality is justified?

So far as endocarditis is concerned, I am convinced that a simply hypertrophied tonsil has little to do with it as a causative factor; that when it happens to have been inflamed before the onset of endocarditis, the infection has been on the surface of the tonsil, and has not started deep in the substance of the organ, and that the removal of the tonsil has little effect on the incidence or recurrence of the disease, except, if it be subject to recurring attacks of inflammation, it in so far makes the tissues about the pharynx, including the tonsil itself, more susceptible to infection.

It is beyond the province of this paper to discuss the relation of the tonsil to other diseases. But I infer it is the same. An uninflamed simply hypertrophied tonsil has slight causal relation to systemic disease. An inflamed and diseased tonsil may have such relation, and undoubtedly does in a limited number of cases.

The indications for removal, so far as this question is concerned then, are, is the tonsil subject to recurring attacks of inflammation, or is it evidently diseased? If the tonsil is simply hypertrophied, such removal, either in whole or in part, as will prevent future attacks of inflammation is sufficient. If it is evidently diseased, and especially if buried and bound down by inflammatory tissue, it must be thoroughly dissected out.

In my experience, an operation with the tonsillotome is adequate for the first class.' The instrument I have used now many years is a modification of the Mackenzie tonsillotome. Since the operation for the complete removal of tonsils has been practiced, I have slightly modified my method of operating, and have found that a complete removal can be accomplished by this instrument.

This operation in experienced hands, in most cases, removes the tonsil as thoroughly as it can be removed by any operation, and in my opinion is as safe as a tonsil operation can be. In inexperienced hands, while the operation may not be as complete, the risks of serious accidents are slight. The operation for the removal of tonsils of the second class by dissection methods is a difficult, and in inexperienced hands a dangerous one. It should be undertaken only by operators of mature experience and skill, and as Dr. Crockett has truly said, by those able and ready to meet dangerous complications that may arise.

XLIII.

CASES OF LATE SECONDARY HEMORRHAGE AFTER TONSILLOTOMY.*

By F. E. Hopkins, M. D.,

Springfield.

The last two or three years have brought me an unusual number of cases of hemorrhage, both primary and secondary, after tonsillotomy. These have been almost wholly among adults. Seeking a cause for this experience, I find a greater number of adults have within that time insisted upon the use of a general anesthetic. Primary hemorrhage, especially with adults, is more profuse under a general anesthetic, and it is possible that I have been more radical, and the deeper removal involves a greater liability to hemorrhage on the separation of the slough.

Thus far only inconvenience to patient and physician has resulted. The operations have been done at the hospital and the patients kept longer under observation. Pressure with the tonsil clamp has promptly controlled the hemorrhage, and while this method may seem crude, it is so readily employed by the house officer and is so effective that it may well be relied upon.

Confident that hemorrhage, primary or secondary, can easily be controlled, it was not my purpose so much to discuss the subject as to place on record some instances of late secondary hemorrhage, and so I offered "Late Secondary Hemorrhage" as a title for this case report. For many years I have felt secure if the sixth day passed with no bleeding, and while in literature one chances upon a rare report of hemorrhage as late as the twelfth day, no such case had come under my observation, nor have I heard its occurrence referred to in discussion. The following are illustrations of late secondary hemorrhage:

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*Read at the Thirty-third Annual Congress of the American Laryngological Association, held at Philadelphia, May 29, 30 and 31, 1911.

Case 1. T. M., boy, age 7, in good health and no family history of hemophilia, operated upon under ether June 21, 1910. Submucous removal of septal exostosis; tonsils and adenoids. Reported over telephone June 30th that at 5 a. m. patient awakened vomiting blood swallowed during sleep, and, according to parents, a large quantity. This was repeated at 4 p. m. of same date, but in smaller quantity.

July 2nd.—Bleeding continued at intervals, and at 12 m. prostration was so marked that I was requested to call. Nasal wound healed; right tonsil healed; bleeding from left tonsillar space; patient very pale; rapid, weak pulse; restless, and at intervals vomiting of swallowed blood. Clamp applied and bleeding controlled.

July 3rd.—The attending physicians, Dr. Fay and Dr. Shores, reported no more hemorrhage and added a further and interesting statement—from its possible causative bearing—that the child showed a well marked eruption of measles.

Case 2. Wm. A., 19 years old, of poor resistance and rather bad family history—father dying of tuberculosis—referred to me by Dr. Ward of Springfield. Nasal respiration obstructed and in addition he had adenoids, hypertrophied tonsils, and lymphoid hypertrophy at the base of the tongue. He is in poor health, his invalidism induced by an endocarditis which left a badly damaged heart, the lesions remaining being both obstructive and regurgitant. The strong pulsations communicated to the larger vessels give the water-hammer pulse. The tonsils were lifted with each pulsation in a way to suggest danger in their removal. Dr. Ward was firm in his opinion that operation was necessary because of the frequent throat infections and the severe systemic disturbance attending such infections.

The tonsils were removed at my office under cocain anesthesia, May 12, 1911, the Farlow punch being used. Very little bleeding attended the operation. The patient was taken to the Springfield Hospital, where he remained three days. He was driven to his home, a journey of twenty miles, and put to bed.

Early on the morning of the 17th hemorrhage began and continued more or less during the day. I saw the patient at 9:30 p. m. Bleeding had ceased and both tonsillar spaces were filled with clot. Vomited blood in quantity was exhibited by the nurse. May 22nd, further hemorrhage occurred, and by this time the family were panic stricken and a second visit was necessary. An oozing which had continued for five or six hours was still going on from the stump of the left tonsil, the right having healed. This soon ceased under pressure but recurred again two days later and in quantity sufficient so that there was again vomiting of swallowed blood and the stools were black and tarry for two days subsequent. Since the 24th there has been no further bleeding.

Recapitulating,—practically no bleeding attended the operation, but a severe secondary hemorrhage occurred on the fifth day, another on the tenth, and still a third on the twelfth.

XLIV.

THE SOCALLED CONSERVATIVE MASTOID OPERATION, WITH A DESCRIPTION OF THE TECHNIC OF HEATH, BONDY, AND SIEBENMANN.*

By George L. Richards, M. D.,

Fall River, Mass.

For the surgical treatment of chronic suppurative otitis media the socalled radical mastoid operation is now generally performed by otologists throughout the world. This operation consists in converting into one cavity the tympanum, aditus ad antrum and antrum, with removal of the drum membrane and ossicles, the closure of the eustachian tube and subsequent epidermization of the entire cavity. This operation saves many lives, and in cases of cholesteatoma no other operation takes its place. Its influence on the hearing is always problematical. In perhaps the majority of cases the hearing is improved; on the other hand, it is sometimes made worse. The operation sometimes fails to achieve the desired result so far as the complete cessation of the suppuration is concerned.[1] The radical mastoid operation is an operation of some gravity, distinctly a major operation, and not without risk, not only to the facial nerve, but in some cases to life itself.

Apart from the cases where the radical mastoid operation would seem to be definitely indicated, there are quite a number of cases of chronic suppuration where the greater portion of the drum membrane is still present, and the ossicular chain is apparently intact, but where the drainage is not sufficiently good to bring about cessation of the discharge. Many of these cases have a fair degree of hearing and the operator hesitates to subject his patient to a severe operation for fear of further injury to the hearing. Whenever such a case is operated upon radically it will usually be found that the source of the infection is in a diseased antrum, the lining membrane of which is secreting mucopus. This mucopus drains out by way of the attic and tympanic cavity, and the perforation in the drum membrane is maintained in spite of vigorous local treatment applied through the perforation. The whole mucous lining of the tympanic cavity is boggy and swollen and the eustachian tube fails to properly perform one of its functions, viz., that of draining this cavity, hence the perforation persists and the discharge continues.

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*Read before the seventeenth annual meeting of the American Laryngological, Rhinological and Otological Society, Atlantic City, New Jersey, June 2, 1911.

Ossiculectomy has been performed for the purpose of stopping the discharge, and although sometimes successful, often fails, because the diseased antrum is not properly drained. Again, ossiculectomy can in no sense be said to conserve the hearing.

Reasoning along these lines and dissatisfied with his previous results, even though these were for the radical operation exceptionally good, Mr. Charles J. Heath,[2] of the Golden Square Hospital, London, took up the problem of draining the antrum and at the same time saving the drum membrane and chain of ossicles. He did this with the idea not only of curing the pathologic process, but of saving and even improving the hearing power in the indivdual case. His first paper was published in the *London Lancet* of August 11, 1906, and was entitled "The Cure of Chronic Suppuration of the Middle Ear Without Removal of the Drum or Ossicles or Loss of Hearing." In this article he stated that "the radical operation is based on the assumption that the tympanum in chronic suppuration of the middle ear is usually in such a condition that it cannot recover health and function, and must be emptied of its contents in order that the suppuration may be cured, an assumption which is surely supported neither by pathology nor clinical experience." "The tympanum and its contents are not, as a rule, so far diseased as to be beyond repair." "The condition of the eustachian tube has a most important bearing on the result, for unless that passage be in a thoroughly efficient condition the perforation of the membrane cannot heal nor the tympanum be restored to health." The following conclusions were naturally arrived at: that, given elimination of the antrum with its foul discharges and consequent improvement in the patency of the tympanum and eustachian tube, given also operative provision of access to the tympanic membrane for observation and treatment, and to the aditus,[3] it was considered more than probable that the remaining tympanic disease would offer no great difficulties and that the cavity would therefore be restored to health and function. Acting on this assumption, ten cases of suppurative middle ear disease were operated upon, the suppuration varying as to its duration from three months to eighteen years, all chronic in type, and all with loss of hearing to a greater or less degree. The results were good as to cessation of discharge and improvement of hearing.

In 1907 a second paper appeared with the same title. In this paper equally good results were reported.[4] As a sequel to these two papers other otologists began to perform the conservative operation.

In a paper read before the Chicago Medical Society, December 4, 1907,[5] Ballenger reported ten cases operated on by the Heath method, and stated that the advantages claimed for this operation over the radical mastoid operation were: (a) "The preservation of the function of the middle ear contents and of the membrana tympani; (b) the improvement in the hearing, whereas in the radical mastoid operation the hearing is usually impaired; (c) the perforation in the membrana tympani often closes in a few weeks after the operation; (d) the morbid process in the tympanic cavity subsides even though necrosis and granulations are present; (e) the antrum and mastoid cells are drained into the auditory meatus, thus relieving the eustachian tube of the excess secretions. The principle upon which the operation is based is that if complete drainage is provided the infectious process tends to subside." Ballenger's ten cases all showed improvement in hearing and the curative results were as good as those obtained by the radical operation. In the discussion which followed, Dr. Beck reported several cases operated on by the Heath method, in nearly all of whom the hearing had improved, and stated that the operation appealed to him very much, but that the indications for its performance should be clearly laid down. In 1909, Ellett, of Memphis,[6] published a description of the operation, and in the same year Kopetzky published a critical review of it.[10] There may be other references in current periodical literature.

While at the present writing the operation cannot be called new, it seems to me that it has not been generally adopted largely because the technic and the indications have not been sufficiently understood. In Mr. Heath's own articles he has endeavored rather to justify his position than to describe his technic, his own descriptions of which have not been sufficiently detailed. I visited him recently and he told me there was no complete description of his procedure in print. I therefore requested the privilege not only of seeing him operate, but of describing the operation. He very kindly acceded and allowed me every opportunity to carefully follow two operations and to write the description at the same time. This description has been carefully revised by Mr. Heath, who has gone overy point in much detail, and elaborated and emphasized, so that what follows is really Mr. Heath's description of the operation, and the most complete yet published.

The patient is prepared for operation in the usual way, except that no hair is removed. When anesthesia is complete a sterile flat sheet of rubber, twenty-four inches square, and with a hole near each of its margins, varying in size for different ears, is stretched tightly around the head and so shaped, by means of a large and a small pair of clamp forceps as to form a well-fitting cap. This avoids the removal of any hair and the two clamps maintain the position of the cap throughout the operation.

The upper part of the ear is drawn as little outwards as will enable the surgeon to use the knife, and the incision commenced one-third of an inch behind the temporal artery and on the same level as the highest attachment of the ear to the scalp. It is then carried backwards to this highest attachment and thence in the angle where the skin of the ear and the skin of the scalp join, all the way down, until it reaches the level of the bottom of the concha. This incision goes through the skin only. With the ear pulled strongly outwards the dissection is carried between the concha and the temporal fascia above, and between the concha and the pericranium behind, until the cartilaginous meatus is reached on these two aspects. The bleeding vessels are all clamped, and during the dissection, the knife is so held that the edge is directed toward the ear; thus the temporal fascia is maintained intact. There is more bleeding when the incision is made at this point than farther back. Thus far none of the pericranium has been cut, nor any of the mastoid bone exposed. The knife is now entered, pointing in an upward and inward direction, between the meatal cartilage and the lower edge of the temporal fascia, until it reaches the margin of the bony meatus just in front of the spine. The edge of the knife should point backward and should damage neither of the two structures between which it is placed. It is then made to cut horizontally backwards nearly to the skin on the mastoid. The knife is then taken out and its point inserted close to the skin and then carried forward to meet the first part of the incision, thus avoiding any liability of injuring the skin behind the ear. This incision passes over the meatal spine and divides all the tissues down to the bone. The knife is then entered close to the meatal spine, and made to cut downwards in a curved line, in harmony with the back of the cartilaginous meatus and as closely as possible to it without injuring it. This cut divides all the pericranial tissue down to the bone, and extends to the bottom of the orifice of the bony meatus. From the lower end of this incision another one, parallel with the first pericranial incision, is carried for a short distance backwards through the pericranium. It is difficult to cut backwards in such a confined area, and the knife is best reversed, so that its back touches the skin on the mastoid. In that position it is pushed forward through the pericranium until it reaches the cartilage of the meatus. These three incisions form the three sides of the pericranial flap which is next separated from the bone with the periosteotome, and pushed back nearly to the skin still attached to the mastoid, folded a little under the skin, and held in place by a small special clip designed by Mr. Heath for this purpose. This clip takes its purchase farther back in the skin of the hairy scalp. An area of mastoid bone about three-fourths of an inch vertically, by about one-half inch horizontally now lies uncovered. The cartilaginous meatus is next separated from the posterior bony wall with one of Mr. Heath's special separators, so designed as to avoid injury to the soft structures. The ligament holding the cartilaginous meatus to the spine (called the coronet ligament by Mr. Heath) is divided with a knife held with point backward to avoid injury to the soft meatus. As a rule the knife is also required to separate the meatus from the temporal fascia in front of the spine so that the roof of the bony meatus shall be visible and accessible. The special retractor is now inserted into the meatus and the detached portion of the cartilaginous meatus compressed against the front portion, which is never detached.

With gouge and mallet the removal of bone is commenced close to the posterior margin of the bony meatus, which margin is taken away from below upwards, in some cases including the spine. The gouge is held as nearly parallel with the surface of the skull as possible so that fairly thin shavings of bone are cut away. In this way the bony opening is deepened, the posterior wall of the bony meatus being removed at the same time as the bone behind it. The opening is gradually deepened until the meatal wall has been removed to within one-quarter of an inch of the tympanic ring. If the antrum has not been already reached a narrower gouge is used for removal of the bone about one-quarter of an inch behind the tympanic ring. In this situation the antrum can always be found. As soon as found it is oriented (explored) by means of a special bent probe, since the amount of bone to be removed depends upon the size of the antrum cavity beneath. The bony covering of the antrum is next removed. If any cell is found to communicate with the antrum the communication is enlarged, and the cell incorporated in the cavity. The mucous membrane of the antrum is now removed with extremely long handled small burrs of various sizes and attached to the handle at various angles. No bone is removed with these burrs, all bone being removed with the gouges. The latter leaves no bone dust which might complicate by causing suppuration during convalescence. All the mucous membrane from the antrum and aditus up to, and as far as the tympanic cavity is next removed. Care must be taken not to dislocate the incus. Even then the cavity is often so small as to be hardly a quarter of an inch in any direction. The smaller the cavity, the more rapidly it fills up. The antrum and aditus being now clear, a small wet cotton plug is used to wall off the cavity during the subsequent steps of the operation. The floor of the bony meatus is now exposed by separation of the cartilage and the ridge of bone between the outer part of the meatus and the (outer part of the) new opening in the skull cut away so that at the bottom the two cavities form one. If the arch of the floor of the bony meatus is discovered to be considerable it is removed with a very narrow gouge. In order to prevent any slipping of this gouge and damage to the drum head, Mr. Heath uses a special drum shield which is pressed against the floor of the meatus just external to the drum head and which forms a perfect protection to that structure. Having removed the arched floor, a further portion of the posterior meatal wall, to within about one-eighth inch of the tympanic ring is cut away. For this he has designed a special forceps.

The next procedure is thorough exposure of the drum membrane. The first step is the preparation of the meatal plastic flap. A special two-edged bent knife is passed into the cartilaginous meatus and made to force its way through the roof of that passage just external to the temporal fascia, care being taken not to injure the fascia. It is then made to cut slightly outwards, or even inwards, if it has not come through at the proper place. For this reason it is double edged. The opening in the roof is at first made about one-third of an inch long. The posterior edge is then held away from the anterior by forceps in the hand of an assistant. The knife is then removed from the inside of the meatus and brought to the outer part of this incision and from its external end it is carried backwards, outwards, and downwards, practically dividing the posterior half of the cartilaginous meatus, down to the floor. When it reaches the floor it should be just within the orifice of the cartilaginous meatus, so as not to be visible from without. It is necessary to bring it as far out as this, for in most cases there is no cartilage on the floor of the meatus farther in, and therefore this incision, if carried directly downward, would practically cut the flap off ;—certainly it would destroy most of its vascular supply. A probe is next passed into the upper opening of the cartilaginous meatus so as to define the passage in its whole length. A pair of special bent probe-pointed scissors are next used, with one blade in the meatus and the other above it, and with the probe as a guide the meatus is divided as far as it reaches into the ear. The posterior flap is then detached from its internal attachment, where there is no cartilage, and is for the moment turned completely out of the ear and held there by another special clip.

An examination of the tympanum is now made. On this examination depends the future course of the operation. If a polypus projects from the tympanum it is removed with a special polypus forceps. The condition of the malleus is seen, and the size and situation of the perforation observed. If the perforation is low down the eustachian tube can be examined with a small probe.

The plug previously used to wall off the antrum is now removed, and a specially devised canula, to which is attached a rubber ball half filled with warm boric lotion, is inserted into the aditus and air blown through, the ball being held in such a way that only air goes through. (A bubble coming through a perforation is more easy to see than any liquid.) Having demonstrated with the aid of air that the aditus and attic are clear right through, the ball is inverted and the lotion is sent through the same canula under considerable pressure. If there is any hidden cholesteatoma in the attic or tympanum, some of it will be washed through. In fact, if any is present some of it is always washed through under these conditions and appears like fine sawdust in the lotion. If cholesteatoma be present the ear is, in Mr. Heath's opinion, doomed, and the radical operation must be performed, as he has never seen a cessation of suppuration with cholesteatoma incompletely removed from the attic. If no cholesteatoma is present and the tympanic conditions indicate the possibility of repair, the conservative proceeding is continued. Another small wet cotton wool plug is put into the antrum. It is hardly ever bigger than a pea. A smaller one is placed in the deep meatus, about the size that the passage will comfortably carry. In the antrum the purpose of the plug is to absorb the plastic lymph that will be thrown out and which would be more difficult to remove from the bone than it would be if it became absorbed in the plug, for in septic cavities, such as these, it should not be encouraged because it degenerates and disappears a few days later. The plug in the meatus has a partly similar reason, but it is also used to prevent the swelling of any portion of the meatal wall which would interfere with proper observation of tympanic conditions during the after treatment.

The pericranial flap is now released from the clip holding it and turned forward towards its place again. The bone to which it was formerly attached having been partially removed, the end of the flap falls into the cavity thus left. The meatal plastic flap is next released from its clip and turned downwards and backwards to cover the floor of the new cavity. These two flaps will be found at some part to come in contact with raw flesh. They are united with a catgut suture where they appear to meet most suitably. There should be no tension on this stitch. In order to get free observation of the cavity during the after treatment, the orifice of the cartilaginous meatus is now enlarged. A scalpel is inserted through the meatus and made to cut upwards and backwards completely through the crux of the helix, so that the surgeon's little finger can be inserted. A drainage tube the size suitable for the bony cavity, usually one-half inch in diameter, is inserted. There must be only slight pressure on the flap, or there may be pain and septic absorption. The inner end of the rubber drain should be pared on two sides to facilitate the entrance of discharge and to diminish its rigidity. The drainage tube keeps the flaps in position and the meatus large, so that observation of the whole area is easy as soon as it is removed during the daily dressing.

The wound at the back is next sutured. Mr. Heath uses coarse silkworm gut stained black, as being easier to see during removal. The needle is passed through both edges of the wound and the ends of the suture brought together, and a double, not a single, twist made. This double twist, when the edges are pulled together in proper apposition, is sufficient to hold them there. The second knot is not tied over it, as Mr. Heath finds pulling the second knot alters the tension of the first and prevents perfect apposition. The stitches at either end of the wound are flush with the end of the incision. This insures perfect apposition at those parts. The end stitches are put in first, then the middle stitch, and nearly half an inch of skin on either side of the wound is included in each stitch. On the conchal aspect of the wound there is very little skin outside the cartilage, and the needle must be passed between the two. The cartilage must not be pierced. Three stitches are applied above and three below the center one.

A large damp dressing is applied and covered with a mackintosh to prevent drying. The following day the outer dressing is taken off, all the stitches usually removed, and a smaller wet dressing is applied. On the next day the dressing is again changed, and also the tube. The internal plugs are withdrawn and fresh ones inserted, after cleansing the wound and examining the cavity. These plugs are moistened in a mixture of equal parts of glycerin and boric lotion to which iodoform is added to the point of saturation.

If the original tube appears tight a smaller one should be inserted, though it is desirable to keep the meatus of full size for the purpose of easy inspection of the deeper parts. As a rule all dressings requiring a bandage are removed at the end of a week, the drainage tube being covered with a piece of dry wool during the day and a bandage at night. No hair having been removed, the patient is no longer conspicuous. The internal cotton plugs and the rubber tube are worn until the cavity is dry. These plugs are changed daily until the secretion has much diminished and then at longer intervals.

Opportunity was afforded me to examine a number of cases at varying periods after operation. One was seen the day following, and the stitches were all removed at this time. Warm sterile water was syringed from the aditus through the perforation by means of Mr. Heath's special canula. No appreciable scar was noticed after any of the operations. The rubber tube is worn until the external auditory meatus is completely healed and has contracted as much as it is likely to. A case seen the fourth day after operation showed the antrum as a large cavity visibly draining into the external auditory canal. I examined a case three months after operation, of a woman whose ear had suppurated for eight years. The drum was present, there was a cicatrix in the center, but no holes in the drum. Hearing was fairly good for watch and voice, much better, she said, than before the operation. She was still wearing a small rubber tube, but this did not seem to me necessary.

In a woman deaf for forty years, with suppuration in each ear, one ear had been operated on three years before, the other one year before; the antrum was visible in each as a partly filled cavity. There were two perforations in the right ear, one in the left. Both ears were absolutely dry, and there was no detritus. The hearing was fairly good for the voice, much better than before the operation.

If the conclusions as stated in Ballenger's article be correct, then this operation should have a wider vogue, for however satisfactory the radical operation may be from a pathologic standpoint, it is not in many cases a conservator of the hearing, nor does it always cure the suppuration. It is an operation of some magnitude with some risk of facial paralysis, which, temporarily at least, is not infrequent. Mr. Heath, on the other hand, has never had a case of facial paralysis, and there have been no deaths after the operation.

Should for any reason at some future time a radical operation seem indicated, the bridge of bone can be removed and the drum and ossicles taken out. In Mr. Heath's experience this has not been necessary. Considerable destruction of the drum is no contraindication, as much of it may be replaced.

Mr. Heath's special instruments can be obtained through Messrs. Arnold and Sons, or Mayer and Meltzer, London, though the armamentarium of the average otologist will be found to contain a sufficient number of suitable instruments to achieve a satisfactory result, once the essential principles of the operation are thoroughly grasped.

POINTS TO BE EMPHASIZED.

The radical mastoid operation is to be performed if cholesteatoma is present in the attic, as Mr. Heath does not think this condition can be cured in any other way. Every cholesteatomatous focus must be removed or suppurative recurrence will take place.

The decision as to whether or not a radical operation is necessary to be done is never made until after examination of the drum, and washing out the attic, as up to this point the procedure is the same in all operations, and no ear is destroyed without a full knowledge of the conditions present.

When he performs the radical mastoid the mucous membrane is not removed below the horizontal part of the aqueductus vestibuli, for fear of injuring the stapes region, with resultant deafness. If this precaution is taken, facial paralysis ought not to occur.

Mr. Heath prefers the eustachian tube to remain open, even if the radical mastoid is done, and does not think the socalled failures in the radical mastoid are due, as so often stated, to an open eustachian tube.

The zygomatic ridge is the upper line of the operative fold.

Use a sharp knife and provide a sufficient number of artery clamps to insure a dry wound.

The incision for the meatal flap is not visible in the concha of the outer ear. It ends one-sixteenth inch inside the concha.

Enough bone must always be removed to allow the flap to lie level on the floor.

Adrenalin is used if the oozing is very troublesome.

The lateral sinus is very rarely uncovered during the operation.

The operator sits on a stool and uses reflected light, wearing a forehead mirror; the room is darkened, and sandbags are used to maintain the position of the patient's head. The mastoid is placed sideways, a little more than half way toward the horizontal. Anesthesia is maintained through the nose or mouth by means of vapor through a tube.

OPERATION OF BONDY.

G. Bondy, an assistant in the clinic of Professor Urbantschitch, has also devised an operation designed to effect somewhat the same result as that of Heath. Unlike Heath, however, who operates on some subacute cases, and who distinctly considers cholesteatoma as a distinct contraindication, Bondy operates only on chronic cases, and includes among them cholesteatoma. He was led up to his operation by some statistics of Ruttin. Ruttin collected the statistics of 1,000 cases operated after the radical manner. Of these, patients who before the operation heard only from one and one-half to two meters, had after the operation no appreciable difference in hearing; but the patients who had better hearing than this, showed after the operation a perceptible loss of hearing. Of 100 cases under Ruttin's own observation, there were 40 who heard conversation farther than two meters, and of these, 8 heard better after the operation; in 6 conditions remained stationary, and in 26 the hearing was worse. In 10 of the 26 cases in which the hearing was worse after the operation, there were 10 cases which had apparently an intact middle ear and small perforation, and in these the loss was very considerable. In 2 cases of perforation of Schrapnell's membrane with intact drum membrane, there was a loss of hearing from seven meters to one-half meter. This loss of hearing was probably due to injury of the previously intact ossicles. Bondy reasons from this that cases of apparently intact ossicles, and with the greater portion of the drum membrane present, but with perforation of Schrapnell's membrane, should be operated upon conservatively if possible. He does not regard Schrapnell's membrane as a part of the tympanic membrane proper. The purpose of the operation is the protection or conservation of the drum membrane and the ossicles, hence it is necessary that the ossicles be neither extracted nor disturbed in their relationship.

At the same time, in order to stop the pus discharge, it is necessary that the middle ear cavity be drained as freely as possible, not only for present purposes, but also in case any further operative procedure should be necessary.

The operation is begun after the manner of a simple mastoid, the pericranium being separated from the bone as far as the external canal only, and the membranous canal not dissected away until later. This allows the absolute protection of the middle ear cavity during the opening of the antrum and the cleansing out of the mastoid cells. When this portion of the operation is finished, the membranous canal wall is detached, the bony canal with the bridge chiseled away, and the lateral wall of the attic completely removed. The facial ridge is taken away almost to the plane of the insertion of the drum, and the usual plastic operation for the external canal made. Both flaps of the plastic are fixed in their positions by stitches, so as not to require very strong pressure from the tampon, and the retroauricular wound is sewed up. The resulting cavity, except as regards the presence of the drum membrane and the ossicles, has the same relationship as after the typical radical operation. One must be careful to see that the attic is laid bare as freely as in the usual method of operation. Should the pus discharge, by reason of disease of the head of the hammer or the body of the anvil, it is easy under local anesthesia not only to remove the ossicles, but to leave the case in the same conditions as though the typical radical operation had been performed. This procedure differs from the usual radical operation in two respects; first, the separation of the membranous canal is made after the finishing of the mastoid operation, thus reducing to the minimum the danger of any injury to the sound conducting apparatus during this stage of the operation, and before the removal of the external canal the antrum is made free as far forward as possible, the entire lateral and the greater portion of the anterior antrum wall taken away, so that the horizontal semicircular canal is entirely visible and the bridge made as thin as possible. The second point in which it differs from the usual radical operation is in the complete removal of the lateral wall of the attic. In the conservative operations of Heath and Siebenmann the lateral wall of the attic has either remained untouched or a portion of the same is allowed to remain for the insertion of the drum membrane. The danger of dislocation of the ossicles is provided for by maintaining the bony external canal until the rest of the operation is finished. As to the necessity of having any support for the drum membrane, Bondy says that the support of the drum membrane in the region of the Rivinian fissure depends not upon bone, but upon ligaments, and that the cutting away of the lateral wall of the attic in no way affects this support. After the operation the form, appearance and movement of the drum membrane remains unchanged. Nor has there seemed to be in any case any undue movement. On the other hand, a radical removal of the lateral wall of the attic is a necessary factor for the cessation of the pus discharge. The after treatment is shorter than after the ordinary radical, and the pain is less, since the attic and the antrum are relatively painless regions, and the cavity of the middle ear is protected. Whether there is any more danger of recurrence of cholesteatoma after this operation is to be doubted, since the cholesteatoma is entirely removed. Here, Bondy is in absolute disagreement with Heath. Heath regards the presence of any cholesteatoma as an absolute contraindication for the conservative radical. The indications for this operation are a hearing distance before the operation of two meters or more, provided it is probable that there is continuity of the ossicular chain and that the middle ear cavity is itself not diseased or but slightly. It is especially indicated where the perforation is limited to Schrapnell's membrane, the drum membrane intact and the hearing good, provided there is no material improvement after a conservative treatment of four weeks.

In the after treatment it is essential that one use light tampons, and that any injury to the ossicles be prevented. I did not have the opportunity of seeing Bondy operate after this method, but I saw one of his cases which had been operated upon, and tested the hearing. The hearing power was good, and no cholesteatoma was apparent. The picture through the speculum was that of a healed enlarged mastoid antrum posteriorly and a drum membrane anteriorly.

OPERATION OF SIEBENMANN.

It is perhaps hardly proper to speak of the conservative operation of Professor Siebenmann, since what I saw him do and what I find described by him[8-9] is rather a conservative type of radical operation than any attempt to save the drum membrane or the ossicular chain. The radical operation as performed by him differs from the radical operation as ordinarily performed, in that all that he does is to remove so much of the bone of the mastoid region and attic as is necessary to make all parts accessible through the external canal, together with the ossicles and the drum. An essential of his operation is his flap, the incision for which is made in the middle of the membranous external canal for two-thirds of the way, starting at the bottom or deepest portion, and then two cuts, one at the right, and one at the left, are made at an angle of about 150° to this, thereby leaving a portion of the flap as a tongue flap, while the lower portion is simply split and lies against the upper and lower walls of the newly made cavity. The curette is not used, as he thinks that nothing is gained in time, the risk to the patient is increased, and the prevention of the reformation of the cholesteatoma is not attained. Siebenmann states that after the healing the covering over the wound surface consists of a layer of epidermis that histologically cannot be differentiated from that of the cholesteatoma matrix. The epidermizing of the uncovered surface, when curetting is not done, is considerably hastened, and the secretion disappears sooner. He has observed the middle ear cavity to be dry for some time, while the edges of the divided membrane of the external canal and the flaps are still granulating. He has not for several years curetted the orifice of the eustachian tube, and since then has no longer noticed purulent discharge from the mouth of the tube. The daily change of dressing and the use of an absolutely nonirritating, very light tampon also helps very much to prevent too exuberant granulation. The retroauricular wound is always sutured.

CONCLUSIONS.

The choice of one or the other of these operations must depend in each instance upon the individual case. That there is a certain amount of risk in the performance of a conservative radical, can hardly be denied, since in these operations it is frequently impossible to completely clear all of the sinuous tortuous spaces which may be involved. Neumann says the sinus tympanicus cannot be cleared in the conservative operation and that in about four-fifths of the cases the long process of the incus is usually destroyed, and that the saving of the ossicles serves no useful purpose. The two crura of the stapes go very early. If it were not so, the stapes would be torn out in many radical operations. The footplate, on the other hand, is fairly well protected.

Alexander considers that the end results as to hearing in the conservative operation, which he terms "attico antreactomy," are no better as to hearing than after the radical. The Heath operation, he says, can only result in permanent healing if the cause is in the antrum, and a careful study of Heath's cases will show that he has operated far earlier than is usual when a radical mastoid is done. If the cause of the trouble is in front of the antrum or in the hypotympanum, the disease is not entirely removed by the conservative operation. The disease is left in order to save the hearing. If one side has good hearing it is allowable to do a Heath or some other type of radical operation, but the healing is far more important than hearing. So far as useful hearing is concerned, the better side excludes the worst side. In the radical operation there is a danger of some loss of hearing, but there is the chance of healing the disease in the bone. The radical operation is done for healing and not for hearing. The typical radical is therefore better than "attico-antrectomy," since after "antico-antrectomy" the healing may not be good.

Finally, I think cases occur in which the conservative operation is indicated, and it seems to me it is better to do a Heath operation whenever the hearing is fairly good, and the disease is apparently limited to the antrum. I think also that the operation of Bondy deserves further trial. In every case with pronounced loss of hearing, where the disease itself seems likely to endanger life, a typical radical operation is the one indicated. I have not yet had the courage to operate after the manner of Siebenmann, and not curette out the cholesteatoma. Professor Siebenmann is an operator of great experience, and I do not feel justified in criticizing his methods, although I did not find, after seeing many radical operations by various European operators, that anyone was following his example in avoiding curetting. On the contrary, the endeavor was always to remove every portion of cholesteatomous material.

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XLV.

INJECTIONS OF BLOOD SERUM FOR HEMORRHAGE, EITHER SPONTANEOUS OR POST-OPERATIVE.

By Clement F. Theisen, M. D.,

Albany.

Hemorrhage after tonsillectomy is always unpleasant, and when it becomes so severe as to endanger the life of the patient, there are very few other complications so alarming and which so tax the resources of the operator.

The following cases are reported to show the probable value of injections of blood serum when other methods fail, or when the patient is so reduced from loss of blood that the administration of another anesthetic for the purpose of suturing the pillars in tonsillar hemorrhages does not seem advisable.

Case 1. Boy, aged 6 years. Removal of tonsils and adenoids. The tonsils were removed by dissection and snare, the method employed by most operators at the present time, and the adenoids in the usual way.

There was very little bleeding during the operation, and when it was completed firmly rolled cotton tampons just filling the tonsillar fossa were pressed firmly into the cavities and held there for a few moments. This stopped the oozing of blood promptly, and in fact during the past fifteen years, since this procedure has been employed by the writer, it has rarely failed to check all immediate hemorrhage, and probably prevents secondary hemorrhage. The cotton tampons can be either used dry or may be dipped in pure peroxide.

The operation was performed in the morning and there was apparently no bleeding during the day, but in the early evening the boy vomited an enormous amount of clotted blood followed by a fresh hemorrhage.

The boy was so hard to manage and in such a bad general condition that it was difficult to determine where the hemorrhage came from. But after the exercise of a good deal of persuasion and tact a fairly good view of the throat was obtained, and it appeared that the bleeding came from a point low down in the right tonsillar fossa. Pressure with the finger wrapped with gauze and with cotton tampons soaked in peroxide and adrenalin was used and after a time the hemorrhage stopped. No spurting vessel could be seen. During the night the writer was again called for another alarming hemorrhage. The nurse saved the blood which again filled a large basin. While pressure was again employed the patient was given 5000 units of diphtheria antitoxin, the normal blood serum not being at hand, and this was repeated in two hours.

After the first injection the hemorrhage appreciably lessened and after the second stopped completely. Two more injections of the same amount of antitoxin were used, however, and there was no return of the bleeding.

This may have been a case of hemophilia, because on questioning the mother, who was a rather ignorant woman, she said that there had been other cases of severe hemorrhage in the family after extraction of teeth and other trivial wounds. The boy made a good recovery.

CASE 2. Mr. P. D., lawyer, aged 44 years. Has occasionally been under treatment for slight attacks of acute pharyngitis. His tonsils are slightly enlarged. On the 18th of January he came to the office suffering from one of his usual attacks. This attack differed from the others as the tonsils were also slightly inflamed. He was given a simple astringent gargle, and was told to return to the office if the throat did not clear up. I did not hear from him after his visit to the office, but on the fifth day after that, his family physician asked me to come to the patient's home as soon as possible.

The patient was sitting up in bed breathing with great difficulty. On examining the throat the entire pharynx, soft palate, uvula, tonsils, pillars, and in fact everything that could be seen, was so tremendously edematous that very little air was able to reach the larynx.

With the exception of a few small spots on the tonsils there was no deposit anywhere. Free incisions were made in three or four parts of the edematous area and a considerable amount of serum escaped, but no pus.

There was a good deal of infiltration of the tissues of the neck, and on the following day there was a board like infiltration of the entire neck, with a good deal of swelling.

The difficulty in breathing, which had been slightly relieved by the incisions on the preceding day, was as bad as ever, and on inspection of the throat the edema was just as great. All the tissues were so tremendously distended that they looked like an inflated toy balloon. Four free incisions, as low down in the pharynx as possible were again made, with another free discharge of serum, but no pus and little bleeding. An ice bag was kept around the neck, cracked ice was used in the mouth and an iced adrenalin spray fairly continuously. The incisions again relieved the breathing to a considerable extent.

About an hour after getting back to my office I was told to come again immediately as the patient was having a severe hemorrhage from the throat. I was shown a large basin full of blood, and within ten minutes, after coughing slightly, he lost fully as much more.

An examination of the throat was made as soon as possible, but the origin of the hemorrhage could not be determined. There was no blood coming from the incisions at the time.

The patient was immediately given 10,000 units of antitoxin and the following morning 20 cc. of antistreptococic serum was injected, as cultures taken after the incisions were made showed almost a pure streptococic infection. From this time on there was no further bleeding. The great edema of the pharynx persisted for nearly two weeks in spite of almost daily incisions. At no time was there any pus obtained. The edema of the pharynx as well as the infiltration of the tissues of the neck slowly subsided, but it was nearly two months before the patient was strong enough to get up. Albumin and casts had been almost constantly present in the urine, and for a month the patient ran an evening temperature running from 100 to 103.

So far as the writer is concerned this was a somewhat unique throat condition, and must be similar to the severe pelvic edemas sometimes complicating streptococic infections. The board-like infiltration of the neck suggested Ludwig's angina, but at no time did the condition go on to suppuration, nor was there any involvement of the floor of the mouth. A tracheotomy did not have to be performed, although for two weeks during the height of the attack the necessary instruments were at hand every day.

CASE 3. The writer was called three weeks ago to see a woman, aged 50 years, who had been having a nasal hemorrhage lasting with few intermissions almost the entire preceding night.

The family physician had inserted a tampon, but the hemorrhage had not been controlled. The tampon was carefully removed, but the hemorrhage was so profuse that the bleeding point could not be located. Another tampon soaked in adrenalin was inserted, but did not check the hemorrhage to any extent. The patient by this time had lost a large amount of blood, and as soon as it could be secured, was given an injection of 10 cc. normal blood serum (horse). This was given late in the afternoon and within a short time the bleeding lessened.

Another injection of 10 cc. was given during the night, with complete control of the hemorrhage and no recurrence after the removal of the tampon.

I do not think there is any doubt that the serum had a prompt effect in this case. The hemorrhage was certainly not controlled by packing and other usual procedures.

CASE 4. Boy, aged 8 years. Had a severe acute tonsillitis followed by an acute suppurative otitis media. The boy's parents lived in the country and did not pay any attention to the ear condition, allowing it to go on for several weeks.

A physician was then called to see him from Albany, and sent him to the Child's Hospital, where he was seen by the writer. The boy was in extremely bad general condition with an extensive mastoid involvement on the left side. His throat was still congested and there was a profuse discharge of pus from the left ear. Temperature 104° F. After being admitted to the hospital the boy had a chill and vomited. The mother stated that he had been having sweats and chills with fever every night for two weeks and some vomiting.

A mastoid operation was performed the morning after he was admitted to the hospital, and while the boy had an epidural abscess and involvement of the entire mastoid process, the lateral sinus after being uncovered seemed to be normal. Blood count before operation showed a leucocytosis of 15,000.

The mastoid wound was left open, that is a good part of it, and on the following day the boy's condition had greatly improved. He did not vomit again, and with the exception of a slight chill after the operation, his chills and sweats also stopped.

Temperature dropped to 100° F. and his condition improved in every way, but on the third day a severe hematuria commenced, which increased to such an extent that the urine contained a large amount of blood each time. He was put on a diet but became so weakened from loss of blood that we decided to try injections of serum. Antitoxin was used, 5000 units being given each time. After the third injection the urine commenced to clear, and after the fourth the bleeding stopped entirely and did not return.

The boy also made an uninterrupted recovery so far as the mastoid condition is concerned.

He remained in the hospital four weeks and I heard recently (six months after) that he was entirely well.

The question of hemorrhage after tonsillectomy is a particularly interesting one, and is receiving more attention since the radical tonsil operation has been performed.

Most men are agreed now that we really see fewer serious hemorrhages after tonsillectomy than we used to after tonsillotomy.

There are a few points which are probably not new but which have come to the writer's attention in tonsil operations.

After an apparently complete tonsillectomy, a small mass of tissue is sometimes seen low down in the tonsillar fossa at the extreme base of the tonsil. This is entirely fibrous tissue and does no harm if left; in fact it is wiser to leave it, because in the writer's experience some postoperative hemorrhages result if attempts are made to completely remove this.

Weil (quoted by Class*), whose researches in hemophilia were so largely responsible for the present status of serum therapy in this disease, reported in 1907 a series of four cases of hemorrhage from different sources treated with serum.

The only case of interest in connection with the writer's paper, was one of febrile polyarthritis with rapidly developing subcutaneous hemorrhages, epistaxis and hematuria.

Patient was treated with intravenous injections of 15 cc. of fresh beef serum, and after one mild relapse was discharged cured.

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*Serum-Therapy in Purpura Hemorrhagica. The Archives of Internal Medicine, Vol. 6, No. 2, August, 1910.

In conclusion, the writer believes that injections of blood serum for either spontaneous or postoperative hemorrhage appear to be of the greatest value.

The control of hemorrhage after the use of serum cannot be regarded as a mere coincidence, because this method succeeds when the usual methods for control of hemorrhage sometimes fail.

Birkett (personal communication) has recently had a case of uncontrollable nasal hemorrhage in a woman aged 65 years, which could be perfectly controlled with normal horse serum.

XLVI.

INTRACRANIAL LESIONS COMPLICATING ACUTE AURAL DISEASE.*

By S. MacCuen Smith, M. D.,

Philadelphia.

Modern pathology no longer limits itself to the restrictions imposed by the terms septicemia and pyemia. Such terms belong to a period antedating our conception of modern advanced bacteriology. This science has demonstrated that surgical sepsis and accidental wound infection are not the only etiologic factors, but that there is a variety of pyogenic infections originating in obscure processes and from unknown causes, to which the term "cryptogenetic" (Leube) has been applied.

Septicemia has been designated as a condition in which pyogenic organisms disseminate from a primary focus into the general blood supply, settle, collect, and multiply in the capillaries. In pyemia they are disseminated, the metastatic suppuration originating in a primary focus. As a matter of fact, both of these conditions actually coexist.

Clinically, a strict differentiation between these two conditions is impossible from a purely scientific standpoint, as the number and virulence of the microorganisms which find their way into the circulation will at one time give rise to localized metastases and at another to general septicemia. As a matter of fact, transitional forms arise (and these are the most common) and we then refer to septicopyemia or, briefly, "sepsis."

Of great importance for the proper understanding of the clinical condition "sepsis" is the knowledge that in different cases various organs and regions of the body may offer the principal focus for the attack of the bacteria. This gives rise to serious local disease, which naturally stamps the affection with a certain degree of individuality and accounts for the fact that such diseases were formerly regarded as special maladies. While clinically there may be the greatest difference between the septic infection of a cerebral sinus and a socalled malignant endocarditis, pathologically they are both mere manifestations of sepsis with a local point of selection.

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*Read before the annual meeting of the American Otological Society, Atlantic City, New Jersey, June 26, 1911.

As is well recognized, the chronic forms of aural inflammation frequently cause intracranial lesions. A consideration of the pathologic changes wrought by the microorganisms of a chronic discharge enables us to appreciate how these purulent products, through osseous softening and carious erosion, produce intravenous and intracranial complications. Although in the past much stress has been laid on the development of endocranial lesions as a complication of the chronic forms of aural disease, we must not lose sight of the fact that these grave diseases probably arise more frequently from the acute infections than we have formerly suspected. This is especially true in young subjects, due, no doubt, to the fact that the very thin and porous osseous walls offer but an ineffectual barrier to the ingress of infectious microorganisms, thereby actually favoring a primary thrombus of the bulb in the one instance and meningitis in the other.

These infective processes may arise either through the numerous venous connections or by means of their intimate juxtaposition. When arising from the acute form of disease, the infection is carried by means of minute thrombi through the mucosal or osseous veins into the sinus wall, forming a mural thrombus, which may continue to increase in size until the vein is entirely occluded. In the chronic form of aural inflammation an endocranial complication usually arises, primarily from osseous softening and subsequent carious erosion, the result of contiguity. When the sigmoid sinus becomes infected the thrombi may extend, by way of the internal jugular, to the superior vena cava, which was demonstrated in the postmortem findings in one of my cases; or they may involve the cavernous sinus and ophthalmic vein by extension anteriorly through the superior or inferior petrosal sinus, or the thrombi may travel posteriorly to the torcular and superior longitudinal sinus, the resulting septic thrombus being discovered at the autopsy, although the condition was not suspected during the antemortem state.

It is claimed that septic thrombi may be carried to the interior of the brain by the backward motion of the blood current when the lateral sinus is obstructed or obliterated, giving rise to metastatic abscess formations. This may explain the method of infection in three cases of hepatic abscess by aural metastasis, reported by me in 1904. Undoubtedly the back current or regurgitation from an obstructed sinus on one side is capable of producing a similar condition on the opposite side through the torcular.

The clinical symptoms of septic sinus thrombosis indicate that the onset is always sudden; although actual involvement of the sinus itself is a progressive process, usually very gradual even when arising from acute aural disease. This is well illustrated in the report of a case incorporated in this paper. The presence of a sterile clot accounts for the absence of more or less characteristic symptoms in the early stages, but it later becomes septic through bacterial invasion, softens, and disintegrates. However, a septic thrombus may wholly disappear through the process of absorption, resulting in complete obliteration of the sinus, which, through thickening and contraction of the walls, is converted into a hard, fibrous like cord. Such conditions are not infrequently found at autopsies, and would seem to explain or deny the implied theory of their congenital origin.

On the other hand, a septic thrombus, through disintegration, may be converted into free pus and remain inactive so long as both ends are securely sealed by a sterile plug and the vessel wall remains intact. The case herein reported illustrates this point.

Since the memorable operation in 1886 by Barker of London, who successfully evacuated an abscess formation from the temporal lobe, in which case the patient presented no external signs whatever of his malady, we have been laboring, and not in vain, for the betterment of our surgical technic and the development of more accurate methods in brain localization. In the first instance our success has been notable; in the latter, disappointment and chagrin still confront us in a goodly number of cases; and yet, even in brain localization, the greatest problem of medical science today, we can report progress. It seems, therefore, that the dawn of a new era is upon us, and that in the near future we will have mastered this perplexing problem. The pathology of brain abscess formation is identical with that of sinus thrombosis; their occurrence would no doubt be much more frequent were it not for the obstacles offered by the dura in its resistance to microbic invasion. In this connection we must bear in mind the important fact that the dura will more readily succumb to sudden or accidental infectious exposure than to the usual slow process by carious erosion. In the latter, the firm resistance of the strong fibrous tissue comprising the dura is greatly increased by considerable thickening, and later still further fortified and protected by the formation of granulation tissue.

By means of the blood stream and perivascular sheaths, pathogenic microorganisms are frequently carried to the interior of the skull, causing brain abscess formations, even though there may be no recognizable softening or carious erosion adjacent to the site of local infection in the tegmen antri or tegmen tympani; this etiologic factor is true, also, in the development of phlebitis and sinus thrombosis, but I believe to a much less extent. On the other hand, as a medium of transmission for the production of meningitis and the various metastases throughout the economy, the blood and lymph route is by far the more common.

The following cases, one of sinus thrombosis and the other of brain abscess, are interesting and somewhat illustrative of the few points in pathology mentioned above:

Case 1. A. D., female, aged 27 years. Admitted to the Germantown Hospital, January 28, 1911. She suffered from severe pain in the right ear for about one week. Claimed never to have had an aural lesion of any description prior to the present illness, and this statement was substantiated by members of her family. Three days prior to admission to the hospital she suddenly developed a Bell's palsy, noticing on awakening in the morning that she could not completely close her right eye nor freely move the right side of her face. At the same time she noticed that her speech was thick.

The patient had an anxious expression, her skin was hot and quite moist, and the pulse soft and rapid. There was no tenderness or other abnormal symptom noted over the mastoid region, and examination of the external auditory canal showed nothing except a mass of detritus. This could be removed only in part, as the slightest manipulation caused considerable pain.

The right side of the neck was swollen from the region of the mastoid almost to the clavicle. This swelling was slightly red, quite tender, and entirely free from fluctuation.

The above mentioned plug of inflammatory débris was removed from the auditory canal on the following day, revealing the destruction of the greater part of the drum head. Temperature on this date was 102.4° and pulse 120.

A mastoid operation was performed on February 3, under general anesthesia. On dividing the periosteum the bone bled freely, there being but little change otherwise in the cortex. After removing the cortex the mastoid cells were found to be soft and necrotic, containing considerable inspissated pus. The tip, however, was not involved, and there was no exposure of the sinus, the osseous covering of which appeared not to have undergone any pathologic changes.

Although I anticipated performing only a simple mastoid operation, the necrotic changes involving the posterior canal were so great that it was necessary to do a complete operation. Assuming that the swelling in the neck represented a Bezold's variety of mastoid disease, a grooved director was introduced into this swelling at the lower angle of the primary incision, but no pus was evacuated. I felt, therefore, that this was an enlarged gland.

With the exception of a rise to 104.2° on February 7th, four days after the operation, the temperature gradually assumed a normal course until February 11, when it began to rise. On February 13 the glandular swelling of the neck had diminished somewhat, but there was still considerable tenderness. The patient appeared quite septic.

On this date Dr. Ross, one of the general surgeons of the hospital, operated on the neck, with a view of removing the enlarged gland. An incision in the line of the swelling revealed a large lymph node over the middle portion of the internal jugular, which proved to be responsible for a considerable part of the edema. During the removal of this node the internal jugular, to which it was firmly adherent, was torn, which was immediately followed by the free escape of considerable pus. After evacuation of this pus the cavity was packed with idoform gauze, following which the incision was partially closed with silkworm gut sutures.

Ten days later the patient was still running a septic temperature. An X-ray showed a distinct shadow in the region of the lateral sinus. A third operation was deemed advisable, and the retropinnal incision was reopened and the lateral sinus exposed. It was about normal in tension and color, and when opened was found to contain thick, ropy pus. There was practically no bleeding until the sinus had been curetted for a considerable distance toward the trochlea. Water was forced through the jugular foramen from above until it flowed from the wound in the neck. The sinus was packed with iodoform gauze, the incision partially closed, and the wound dressed with sterile gauze.

A bacteriologic examination of the pus showed pure streptococcic infection.

After this operation the patient was pale and the hemoglobin and red blood count low. She was placed on abundant feeding and was given daily a hypodermic injection of one ampoule of "injectio ferri compositus" (citrate of iron, gr.j), under which treatment the hemoglobin and red blood count rapidly increased to approximately normal.

On March 1st the pulse and temperature reached normal.

On March 13th an abscess over the right buttock was opened, containing approximately half a pint of pus. The patient stated that she had had this swelling for three weeks, but did not mention it through fear of necessitating further operative procedures.

On March 23rd, under nitrous oxid anesthesia, Dr. Ross opened the abscess over the right buttock in three places, and inserted rubber drainage. At the same time a slight plastic operation was performed to close the opening back of the right ear.

On March 30th a small abscess about the middle of the outer side of the left hip was evacuated.

The above case is here reported with a view of showing the great destruction that may take place as a complication of an acute aural infection. It seemed so improbable that within a period of about ten days the carious erosion of the mastoid and middle ear should have been so great, together with the Bell's palsy and lateral sinus and jugular thrombosis, with subsequent disintegration of the clot, as well as metastatic abscess formations, that I made every effort to confirm or disprove the statement of the patient and her relatives that her aural condition was really of the acute variety, and although I was finally compelled to accept their version of the situation, I nevertheless feel somewhat skeptical as to its absolute accuracy. If, however, their statements are true, and of this there seems to be no reasonable doubt, the case is both interesting and instructive to show the rapid destruction and complications arising from this bacterial invasion in an acute aural disease.

CASE 2. I am indebted to Dr. H. A. Rothrock, of West Chester, Pa., for the detailed history of the following case: Patient, Dr. J. R. H., aged 30 years. Family history negative. The patient suffered from most of the usual diseases of childhood, and in addition to these, he had typhoid fever when two years old. About ten years ago he was treated for an acute otitis media, from which he made a prompt and permanent recovery.

On February 25, 1911, he had an attack of "la grippe," but owing to the serious illness of his father, also a physician, he remained in bed but two days, and then attempted to attend to both his own and his father's practice. During this time his temperature ranged as high as 103°. After about three days he became so prostrated that he was again forced to give up work and confine himself to his room. His ear now started to pain him severely, and after two or three days the drum ruptured spontaneously, with a very free discharge. When I first saw him he was still suffering intensely, the discharge was free, of a ropy consistency, and light yellow in color. The entire surface of the deep canal was swollen, obstructing a view of the membrana tympani. His temperature at this time was about 102°, and he seemed to be suffering from the great depression that was characteristic of the whole course of his illness, in marked contrast to his usual happy disposition. After thorough cleansing, aristol was insufflated, and this treatment was continued until the time of the first operation. His diet was restricted and a calomel purge given. Under this line of treatment the discharge abated, the funicular appearance of the canal disappeared, and in two or three days the drum was clearly visible, showing a medium sized opening in the lower anterior quadrant. Improvement was gradual but steady for a period of about ten days.

On the afternoon of March 12th his condition suddenly changed for the worse. The pain again increased and headache set in. During the night he commenced vomiting, of the projectile type. When seen Monday morning, his temperature was ranging around 104°, the pulse rate 90, and respiration about normal. The tongue was heavily coated, and he complained bitterly of pain in the head, mostly frontal, to which location the headache was referred throughout the subsequent course of the disease. There was no bulging of the posterosuperior wall of the canal, no swelling back of the ear, the pressure failed to show any spot of tenderness over the mastoid region. Vomiting continued more or less during the day, and the patient was still irritable and depressed.

About noon he was admitted to the Chester County Hospital, and Dr. S. MacCuen Smith was called in consultation, seeing him about 8 p. m. By this time the posterosuperior wall of the canal was sagging, and deep, hard pressure over the mastoid region elicited some tenderness. Temperature was 104°, pulse rate 90, and respiration 24. Dr. Smith advised and performed a simple mastoid operation. Some granulation tissue and considerable free pus was removed from the lower cells and antrum, securing the establishment of a through-and-through drainage. There was no exposure of either the sinus or dura, the osseous walls covering the same being normal in appearance.

Following the operation the temperature gradually subsided, the discharge decreased considerably in amount, and with the exception of the stitches becoming infected, the course of the disease was apparently normal. However, the patient's mental depression continued, though even in this there was daily improvement. By March 18th his mentality had greatly improved, and the temperature, pulse and respiration had reached normal, which condition remained until the 21st of March.

On the afternoon of this day the temperature rose to 102°, but promptly dropped again with the evacuation of pus from a stitch abscess in the upper angle of the wound. After this the temperature remained about normal until March 25th, when it reached 100°. The next night the patient was seized with violent headache, which lasted with greater or less severity until within a few hours of the second operation. From this time on the prostration and depression increased daily, and for brief intervals the patient would become delirious, being, however, easily recalled to his surroundings. Mental activity decreased gradually. On the 27th his temperature rose to 100.8°, falling the next day, on which the highest record was 99.4°, and reaching normal again on the 29th of March for a brief period, after which it rose to 100.4°. During this time the pulse and respiration continued about normal.

On March 31st the temperature was nearly normal at midnight, with a pulse of 56. Again it ascended to 101°, around which point it stayed for the next few days. By this time the delirium was becoming more pronounced, although the patient could still talk and think intelligently most of the time. At intervals there was some apparent weakness of the left side, though not as yet sufficiently marked to be at all positive. The pupils were equal, reacted well, and the eyeground, save for some congestion of the retinal veins, was normal. On this day Dr. Smith again saw the patient, in connection with Dr. John H. Gibbon and Dr. George E. Price. By this time pressure symptoms, probably from a brain abscess, seemed to be definitely marked, but in the absence of localizing symptoms it was deemed best to wait a day longer before operating, hoping by that time to gain some definite guide as to accurate localization. On April 1st, left arm and leg paralysis was quite well defined, speech was thick, and the mental condition aggravated. Arrangements were made to perform the complete mastoid operation, with exploration of the brain, on the following day. That night the patient's condition became seriously worse, and by morning he had sunk into a typhoid state, from which he aroused for one or two momentary periods, during which he seemed to recognize those around him. There were constant convulsive movements of the right arm and leg, the left side being apparently paralyzed most of the time, although, strangely enough, on two or three occasions he regained their use, showing his remarkable vitality. At 11 o'clock on Sunday morning, Dr. Smith, assisted by myself and Dr. A. Spencer Kaufman, performed a radical mastoid operation. There was not the slightest evidence of further carious erosion in any part of the mastoid or tympanic cavity. The brain cavity was opened through the tegmen antri. The bulging dura showed abnormal intracranial pressure, though no pathologic change was noticed in the dura itself. On incising the dura, healthy brain matter crowded into the wound.

The Jackson brain forceps were introduced, first upwards, inwards and forwards, then upwards and inwards, and again upwards, inwards and backwards. The third time there was a gush of about one ounce of pus from a cavity located about two inches deep from the dural surface. The lateral sinus had already been exposed and found to be healthy. A drainage tube was introduced into the abscess and the wound packed and dressed.

The next day the patient's mental condition was considerably better, but the temperature was now ranging about 104°, the pulse from 120 to 150 and the respiration had reached 32.

On the following day the patient's condition was less satisfactory, and Dr. Smith removed the tube, which was somewhat occluded. This provided for the free escape of some pentup pus, and resulted in a temporary betterment of the patient's condition. A drainage tube was reinserted in the old tract.

An examination of the pus showed a pure streptococcic infection. In the meantime autogenous vaccines had been administered. A few days later the pus, which was gradually becoming less in quantity, ceased. The tube was removed, but no pus evacuated. Apparently the abscess had been completely drained.

Despite all that was done, however, the patient's condition became steadily worse and he died on April 6th. The temperature taken in the axilla shortly before death was 106.2°, pulse 180, and respiration 60 to 70. An autopsy was refused.

The differential blood count, as made by Dr. Wellington W. Woodward, is interesting, as it well demonstrates not only the severity of the infection, but the patient's great power of resistance. On the day of the first operation he presented a leucocytosis of 12,000, which gradually increased up to the time of the second operation to 15,000, with a polynuclear percentage of 86.5, whereas the day before his death the leucocytosis was 22,600 and the polynuclear percentage 93.1.

From the above history it would seem that a brain abscess formed within two weeks of the time of this patient's initial ear lesion. Although he seemed to improve materially after the simple mastoid operation, yet the mental state was never entirely satisfactory, and I feel, therefore, that the collection of pus within the interior of the skull must have been deposited through the medium of the blood and lymph streams very early in the course of the disease, and was present or in process of formation at the time of the first operation.

Another point of interest is the fact that I succeeded, apparently, in evacuating the pus from the parent abscess formation. The patient's death, therefore, was probably due to a diffuse meningitis or general encephalitis as a result of ruptured satellite abscesses.

It is also interesting to note that the abscess was situated about two inches beyond the dura, with healthy brain tissue separating these two points.

The refusal of an autopsy denied us the opportunity of ascertaining valuable clinical facts.

XLVII.

THE ETIOLOGY OF OTOSCLEROSIS.

By W. Sohier Bryant, A. M., M. D.,

New York.

The great diversity of opinions on the etiology of otosclerosis stands in striking contrast to the almost complete unanimity in regard to the anatomic changes of the otosclerotic foci that occur in the labyrinthine capsule. The present paper is an attempt to classify the various views that have been advanced, in the hope of arriving at a more definite conclusion concerning the etiology of the disease.

It is a well-established fact that the variable lesions of otosclerosis are exact counterparts of variable osteitic lesions occurring in other parts of the skeleton. In all these bone affections the progressive stages of the osteitis are as follows: first, the vascular osteitis of Volkmann, then replacement of the normal bone by osteoid tissue, and finally osteoporosis or rarefaction of the bone. It is generally accepted that these bone changes in the skeleton are due to a variety of causes, both toxic and trophic in character. Among the toxic causes may be mentioned syphilis and infections such as puerperal osteomalacia and infantile rachitis. The trophic causes include similar changes of a trophic nature, as noninfectious osteomalacia associated with alterations in the internal secretions.

A number of authors, without assigning a fundamental cause, have been content to consider otosclerosis a primary disease of the labyrinthine capsule. These authors are Bezold, Brühl and Politzer,[4] Ed. Hartmann, Kalenda,[14] Jörgen Möller, Siebenmann, and Stein. Politzer goes so far as to say that the disease may occur in perfectly healthy individuals.

Inherited defect has been thought by Wagner to be the cause of otosclerosis. Siebenmann and Manasse, who by the way also consider the lesion a primary disease of the labyrinthine capsule, have explained the etiology of otosclerosis on an embryonic basis. They believe it to be due to an atypical development of embryonic cartilage, the new spongy bone being formed at the expense of the remnants of the primary cartilage in the capsule.

Politzer,[20] Jörgen Möller, and Lindt consider that they are justified in their assumption that otosclerosis is primary in the labyrinthine capsule on the basis of their observations upon otosclerotic lesions which they found separated from the periosteum by normal bone. This finding is in startling conformity with observations concerning osteomalacic lesions: in the latter normal bone is often found separating the osteitic foci from the periosteum.

According to other authorities, otosclerosis originates in the middle ear and is a secondary disease of the labyrinthine capsule. Among them are Bezold and Scheibe, Habermann, Katz, Lucae,[18] Manasse, Schilling,[23] and formerly Politzer, whose present definition of otosclerosis, however, requires that the disease shall be primary in the labyrinthine capsule. In corroboration of this view of origin in the middle ear, Gradenigo and Leland[17] state that the treatment of catarrhal inflammations in childhood—which lead to otitis media—prevents the development of otosclerosis in adult life. Habermann,[12] Hammerschlag and Katz think that otosclerosis originates in the periosteum of the middle ear.

Some authors—Manasse, Jörgen Möller, Lindt, and Katz[15]—have found otosclerotic foci at the internal auditory meatus. This view justifies, in part at least, the opinion of Denker, Habermann of Breslau, Hegener, Katz, and Scheibe, that otosclerosis originates in the internal periosteum or dura mater.

Trophic and toxic conditions have also been named as being causative of otosclerosis. There appears to be good evidence that the disease may be the result of interferences with general nutrition, as believed by Heiman.[13] Tweedie[26] and Walb[27] consider it the result of changes in the blood and circulation, and as due to general infections. Yearsley[29] considers anemia and chlorosis important causes of otosclerosis. Toynbee, Körner, Yearsley,[29] and Lucae assign gout as the chief cause. Lafitte-Dupont and Manfetil are of the opinion that otosclerosis is a complication of high blood tension and arteriosclerosis.

Menstrual irregularities, pregnancy, and childbirth have been advanced by Sewell[25] as the chief causes of otosclerosis.

Politzer,[20] also, originally believed otosclerosis to be an infectious osteitis, originating in pregnancy. Milligan concurs in this view. Hanau states that the temporal bone is altered in pregnancy, at the same time when other parts of the skeleton are affected. Yearsley and Cornet[6] think that the intoxication of pregnancy is an important cause.

An inflammatory origin is assigned by Katz as the cause of the disease, and Heiman[13] and Grunert[11] believe it to be due to a specific inflammation. Certain authors—Hammerschlag and Mannasse—consider otosclerosis a chronic osteitis of the temporal bone. Various etiologic causes have been advanced for this chronic osteitis.

Ferreri[10] states that otosclerosis is an infectious disease, identical with osteomalacia and rachitis, and he believes that this identity of origin explains certain hereditary cases of otosclerosis.

Many authors, including Virchow, Volkmann, Habermann,[12] Körner, Sewell,[25] Gradenigo, Grunert,[11] Baginsky,[2] Yearsley,[29] Pommer, and Brisch[3] together with Blumenthal and Hoffmann, consider syphilis the chief cause of otosclerosis. Chronic toxemia, especially gastrointestinal toxemia, is assigned as the cause by Escat[8] and Cornet.[6] The latter writer[5 6 7] believes that otosclerosis is due to general infection, chiefly traceable to autointoxication. He also names renal and hepatic insufficiency as causative factors.

Gray, followed by Sewell[25] and Yearsley,[29] considers otosclerosis due to the thrombosis of the vessels of the bone and death of the bone, resulting from causes favoring local thrombosis.

Schmiegelow[24] maintains that trophic disturbances are the cause of otosclerosis. Alexander,[1] on finding otosclerosis present in cretins, declared that the affection may follow changes of internal secretion.

Of late considerable emphasis has been laid on the association of otosclerotic changes with degeneration of the auditory nerve and with paresis of the sensory supply of the external meatus. According to Tweedie[26] and Walb,[27] otosclerosis is primarily an affection of the nervous system; Cornet[8] and Manasse[19] also believe the disease to be due to nerve lesions. This view of a nervous origin was advanced as far back as 1884, when Woakes[28] expressed the opinion that changes in the ear, which according to his description resembled otosclerosis, were of vasomotor origin and were due to a defect in the sympathetic nerves and the cervical ganglia. He believed that these defects unfavorably influenced the region—including the ear—of which the cervical ganglia are the trophic centers. Woakes claimed that the nerve disturbances could be traced to hereditary defect or predisposition.

It is unfortunate that a suitable designation has not as yet been found for the lesion under discussion. Notwithstanding the high authoritative backing of its nomenclature, other terms which, according to the views of various authors, would be more fitting, have been put forward from time to time, and especially of late. Manasse,[19] for instance, favors the use of the term "osteomalacia," because, as he says, the principal characteristic is chronic inflammation of the bone. On this point my own views agree with those of Manasse. I believe, however, that it is desirable to qualify the word, making it more definite; and I therefore suggest as a term certainly more appropriate than the one now in use, the designation "labyrinthine osteomalcia."

Having thus passed in review the various theories, practical and theoretical, advanced by these forty-five authors, the writer desires to add his own conclusions on the subject. Without entering into further discussion of the causes that have been enumerated, I believe that the origin of otosclerosis is various—just as similar osteitic changes occurring in other parts of the skeleton may be attributed to a variety of causes. The result of all bone irritation must be the same, for the structure of the bone is such that whatever the irritant, no other change could take place in chronic nonsuppurative inflammation. Many authors have attributed trophic and toxic disturbances as etiologic factors of otosclerosis. I coincide in this view and believe that these trophic disturbances are due to altered internal secretion, chiefly of the thyroid gland. It is my opinion that in many cases the trophic disturbance affects the otosclerotic foci only indirectly, acting, as suggested by Woakes, through the medium of the sympathetic or trophic nerves. I am in entire agreement also with Gradenigo and Leland, that otosclerosis may be prevented in adults if the catarrhal infections of childhood are treated properly, for the principal cause of otosclerosis is chronic infection of the upper air tract. In adult life, as well as in childhood, the condition of the nasopharynx has a most important etiologic bearing upon otosclerotic changes.

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XLVIII.

A CASE OF RAREFYING OSTEITIS OF THE MASTOID BONE.*

By Charles W. Richardson, M. D.

Washington.

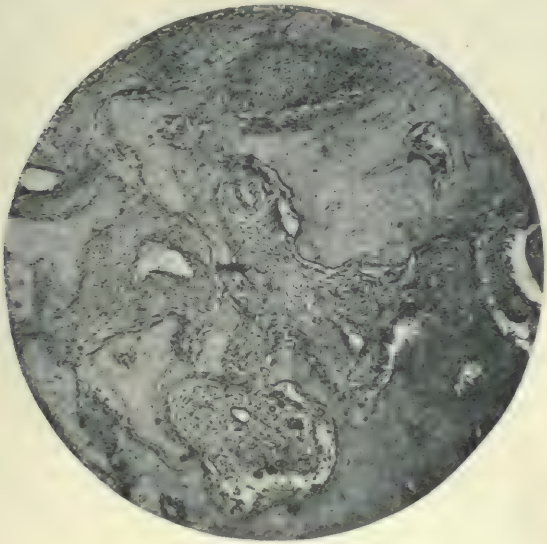
I present this case of rarefying osteitis of the mastoid bone partly on account of its rarity and partly on account of the fact that this is a unique case in otologic practice, and on account of the rarity of this type of bone inflammation as affecting the flat bones.

On October 21, 1910, a man of 32 years came under my care with the following history: In January, 1910, he developed an acute inflammation in the right middle ear, which subsided after running the usual course. There was a moderate degree of mastoid tenderness, which did not abate with the cessation of the middle ear inflammation. This mastoid tenderness, which was intermittent at first, towards the end of February became continuous, with exacerbations of intense suffering at night. In March he developed what was stated to be an abscess in the canal, which was incised on two separate occasions. There was no relief afforded the patient to the mastoid suffering by the opening of the abscesses in the canal wall; the mastoid pain became more intense with each succeeding month, until the patient was nearly exhausted from pain and loss of sleep, when he came under my observation. The patient states that, while the pain was most intense in the mastoid region, it radiated from this region all over the head. He also stated that large knots formed on his head at night, which would subside during the day.

I must confess that, after listening to the patient's history and his description of his intense suffering, I felt quite skeptical as to its truthfulness. During the greater portion of this period he had been under the observation of several aurists.

***Read before the American Otological Society, Atlantic City, New Jersey, June 26, 1911.**

On examination of the patient I found that I had erred in my opinion. There was a slight infiltration of the soft tissue over the mastoid. The auditory canal and the membrana tympani were normal, the whole mastoid region was exquisitely tender —more so that I had ever observed in any patient before—and the slightest touch with the finger would cause him to cry with pain. This tenderness was limited entirely to the mastoid. The patient would permit considerable pressure beyond the confines of the mastoid without any evidence of suffering. A blood count was made the same day, showing 9,300 white cells with a practically normal differential. The patient's temperature taken at this time was 99° ; when taken at the hospital the following morning, it was found to be normal.



I was uncertain as to the nature of the condition which here presented itself, but, feeling that relief was demanded, I decided upon doing an exploratory operation the next day.

The usual operative procedure was adopted as in doing the ordinary mastoid. After incising the infiltrated soft tissues and raising the periosteum, during which a few drops of pus were seen, the exposed bone over the mastoid presented two peculiar phases, viz., it was of a pinkish color and imparted a decidedly rough sensation to the examining finger. This area of discolored bone also seemed to be slightly raised above the surface of the adjoining healthy bone. The area of diseased bone was chiseled away in every direction and as far inward as the inner table of the bone. It was not deemed necessary to open into the antrum mastoideum. Various chippings and large pieces of bone were saved for microscopic examination. The patient never had a particle of pain after coming out of the anesthetic and made an uninterrupted and rapid recovery.

The pathologist of Providence Hospital, Dr. R. A. Hamilton, made the following report on the specimens of bone placed in his hands:

"Macroscopic examination of specimen. The bone is redder and much soften than normal, some of the pieces being easily fractured by pressure of the fingers.

"Microscopic examination (after decalcification) shows increased production of connective tissue and round cell infiltration, the character and morphology of the cells excluding malignancy. In some of the sections there are areas where the bone is undergoing absorption, and, in others, there seems to be a direct formation of new bone. The microscopic picture is one commonly met with in rarefying osteitis."

XLIX.

BLOOD CULTURES IN OTOLOGY.*

By Frederic E. Sondern, M. D.,

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The relative frequency of instances is noteworthy in which the positive or negative result of a blood culture is of distinct diagnostic value to the otologist. The comparatively few published accounts of its use would seem to indicate that this valuable diagnostic aid has not had the general attention in the routine practice of the specialist it deserves.

Emanuel Libman of the Mt. Sinai Hospital is certainly entitled to the credit of having done much original work in blood culture studies in diseases of the ear, and his pioneer publications on this subject are both interesting and instructive. The attempt to base positive and unexceptionable rules solely on the outcome of this procedure is an error, just as in any other laboratory aid, and it is this effort that has led to controversy and more or less discredit. The object of this communication is to rehearse briefly the value found in positive as well as negative blood cultures in otologic practice and to demonstrate the relative ease of the technic.

In cases of acute purulent otitis media without or with mastoid involvement, bacteria are not usually found in the blood cultures. There are exceptions, however, and these cannot always be ascribed to errors in technic, as they have occurred in the experience of numerous competent clinicians and accurate laboratory workers. It also does not seem justified to claim that an unrecognized thrombosis exists in these exceptional cases. Fortunately these exceptions are rare, particularly after efficient surgical treatment of the middle ear and mastoid.

In the cases in which there is a thrombosis of the sinus, bulb or vein, bacteria are found in the blood cultures in a very large percentage of the cases. Exceptions to this rule also occur. A thrombus is quite firm at first, and if it contains but few organisms those may be killed by the bactericidal power of the blood itself. Even if infected to a greater extent, the firm clot may prevent the organisms from getting into the blood current. It is even possible that pieces of infected clot may break off and be carried by the blood to distant parts, causing metastatic suppurating foci without bacterial infection of the blood stream itself. In the large majority of instances, however, the softening of the thrombus causes bacteria to be fed to the blood stream in increasing numbers, and then positive blood cultures are invariably obtained. Not only an extension of the infection to the sinus with a resulting thrombosis will produce a bacterial infection of the blood current, but a secondary meningitis, a brain abscess or even an extradural suppurative focus may subsequently do the same. It is also very important to remember that these general invasions of the blood current may result from local processes other than in the ear, and the mere fact that a bacterial infection of the blood stream is found naturally does not necessarily indicate otitic origin.

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*Read before the American Otological Society, Atlantic City, New Jersey, June 26, 1911.

In a given case of acute suppuration of the middle ear with mastoid involvement, a positive blood culture should not be accepted alone as certain evidence of a coexisting thrombosis of the sinus. It has been demonstrated, as previously stated, that exceptionally a bacteremia does occur without a thrombosis of the sinus, but this is certainly unusual, to say the least. After proper surgical treatment of the middle ear and mastoid in these exceptional cases, the bacteremia should decrease and disappear together with the proper behavior of the condition clinically. On the other hand, should the colonies increase in number in the subsequent cultures, it may be accepted as strong presumptive evidence that an extension of the invasion has occurred. The most frequent extension is into the sinus with resulting thrombosis, and for this reason the bacteremia is usually quite properly looked upon as one of the evidences that such extension has occurred. In the great majority of instances, however, a bacterial invasion of the blood current does not occur in the cases of middle ear and mastoid infection unless there has been an extension into the sinus or elsewhere.

While the presence and particularly an increasing degree of bacteremia may justly be accepted as an indication of such extension, the clinical evidences are imperative to determine what structures have been invaded. It is self-understood that the direct invasion of the circulatory apparatus will lead to positive blood cultures far more easily than an invasion of the meninges or brain tissue, and subsequent infection of the blood stream, but, after all, the clinical symptoms and not the blood culture must determine the nature of this extension. An extension of the process beyond the mastoid may occur and still may not give rise to a bacteremia for the reasons previously stated, namely, a firm clot with a small or large number of organisms may not cause infection of the blood current until softening of the thrombus occurs. For this very reason it is evident that a single culture, if negative, may be misleading. When suggestive symptoms occur, a negative blood culture may be used as an argument against sinus thrombosis possibly for the moment, but if these symptoms continue, repeated cultures are necessary, as the former negative culture can have no weight whatever.

It is natural that intercurrent diseases or complications of the original causative disease, with consequent elevation of temperature, may occur during the course of an otitic infection. The blood culture aids in the differential diagnosis, though careful clinical observation with indicated laboratory aids, are at least equally important and sometimes more so. Acute articular rheumatism shows a negative blood culture, while a pyemic joint is usually associated with a bacteremia. Pneumonia usually gives physical signs and possibly a bacteremia of other type than the otitic infection. Typhoid shows a leucopenia and relative lymphocytosis, and possibly characteristic organisms on blood culture or a positive Widal reaction, while an extension of the otitic infection shows a leucocytosis and relative polynucleosis and possibly a positive blood culture of the organism found in the ear. Tuberculosis also shows a leucopenia and relative lymphocytosis and even a positive Diazo reaction at times, but the blood cultures are sterile, and a von Pirquet or Calmette may be positive. Unusual temperatures and disturbing symptoms, such as headache and local neuralgia, due to an unrecognized acute nephritis, may develop during the convalescence of a scarlet fever mastoid.

If perchance a streptococcemia exists, which is not unknown in this disease, an erroneous diagnosis of sinus thrombosis would easily be made, if the rule is accepted that a bacteremia invariably indicates this complication.

The following conclusions seem justified: Early positive blood cultures with an unopened mastoid infection usually indicate coexisting sinus thrombosis. The possible exception must be kept in mind, especially in absence of all clinical signs. Negative blood cultures under like conditions usually allow the exclusion of a sinus thrombosis. The possible exception must be remembered, especially if suspicious clinical signs exist.

Late positive blood cultures in operated cases of mastoiditis with exacerbations of temperature after a longer or shorter afebrile period, also usually indicate thrombosis. But it is in these cases that particular care must be exercised in concluding that the infection of the blood stream is due to a thrombosis and not to a meningitis or brain abscess, to say nothing of a more distant point of invasion not necessarily secondary to the mastoid suppuration. Negative blood cultures under like conditions usually allow exclusion of a thrombosis and indicate careful search for other causes to explain the temperature curve; but the exceptions to this rule must not be forgotten.

With reference to the organisms found, the streptococcus is without doubt the most frequent invader of the mastoid and deeper structures, and in consequence is the organism most frequently obtained in blood cultures. The streptococcus mucosus and the staphylococcus occur next in the order of frequency. While most of us have not seen a sinus thrombosis follow a pneumococcus infection of the ear, the evidence is not yet nearly sufficient to justify a conclusion that it does not occur. With due regard to the difficulty in differentiating streptococci and pneumococci, and admitting the inability to do so in some instances, there does seem sufficient evidence at hand to believe that the pneumococcus does act as a pyogenic organism in the mastoid, and consequently it seems difficult to understand that it cannot produce a sinus thrombosis as well.

It is certainly true that the staphylococcus and pneumococcus found in otitis media are far less apt to cause mastoid and deeper seated complications than the streptococcus and streptococcus mucosus, but absolute rules should not be made concerning the relative virulence of one organism as compared with another, or that certain structures are immune to certain bacterial invasions. More searching investigations of the bacteria concerned in the production of the suppurative processes under consideration may teach much of value, for the anerobic organisms present have had but little attention as yet.

Blood culture work in this as in other fields should be done quantitatively, that is, not only the organism should be determined, but the number of colonies per cubic centimeter should be estimated. This is of particular value when cultures are repeated, as a decrease or an increase in the bacteremia is thus learned. If the organisms present produce hemolysis is a point which should also be carefully observed, as it invariably indicates a more serious condition than when this solution does not occur.

Blood cultures should when possible be made by those thoroughly familiar with the laboratory technic, as the distribution of the blood in the different media must be done before coagulation occurs, and to do this accurately and quickly with blood at the point of coagulation requires dexterity only acquired by practice.

A suitable vein, if possible at the bend of the elbow, is selected and a constricting bandage is applied above. The region is thoroughly cleansed with green soap, ether and alcohol, and a drop of tincture of iodin allowed to dry where the puncture is to be made. If a properly sterilized 10 cc. all glass syringe with fine iridoplatinum needle is used in place of the 25 cc. hospital affair with a trocar-like weapon attached, the patient usually makes no objection whatever to the original or repeated aspiration. Having obtained from 5 to 10 cc. of blood, an assistant or nurse removes the bandage, holds the arm up for a few minutes and applies a drop of collodion over the puncture. The obtained specimen is quickly and accurately distributed in the different media, namely, flasks of plain bouillon and glucose bouillon, and plates of glucose agar, serum agar and glucose serum agar. These are incubated at 37.5° C. and examined at eighteen hour intervals. The rapidity of growth varies decidedly with the same type of organism, and prolonged observation is essential before the culture can be considered sterile.

The difficulty of transporting the various culture media to the bedside in private practice and the danger of partial coagulation before the blood has been accurately distributed, induced Epstein (*American Journal of Medical Sciences,* September, 1907) to suggest the use of a method to prevent the coagulation of the blood and thus allow the distribution to be made at leisure in the laboratory.

A large tube containing 10 cc. of an isotonic ammonium oxalate solution, the whole properly sterilized, is carried to the bedside, into which the aspirated blood is immediately introduced and a complete mixture made. This specimen can then be accurately distributed in the various media at the laboratory. Ryttenberg (*Journal of Medical Research,* XX, No. 1) has demonstrated the comparative value of this method, and a limited experience with it tends to corroborate his results. Another advantage it has is that it can be put into the hands of the surgeon for the purpose of obtaining the specimen which is subsequently handled by the laboratory worker.

L.

SUPERNUMERARY AURICLE ASSOCIATED WITH CHRONIC SUPPURATIVE OTITIS MEDIA.*

By Harold Hays, A. M., M. D.,

New York.

Among the less common congenital conditions with which one comes in contact are the socalled auricular appendages or supernumerary auricles. In the ear clinics of this city, perhaps one or two noticeable cases are seen in a single year.

The auricular appendage is commonly classed among the fibromata. The fact is that it is composed of the same elements as the rest of the auricle and is but an excessive epithelial growth from the first branchial cleft. As a rule, they form pedunculated tumors in contiguity with the tragus. Only one may be present or as many as six or eight. Oftentimes the tragus itself is larger than the corresponding one of the opposite side. According to Virchow, these tumors consist of reticular cartilage, subcutaneous cellular tissue and skin. Although they are usually connected to the tragus, they may spring from the lobule, the shoulder or the side of the neck. Warner claims that such a congenital defect is usually associated with some other congenital anomaly. Out of 50,000 school children examined by him, only thirty-three were found with supernumerary auricles. This percentage is perhaps justifiable, if one includes many of the fibrous excrescences occurring on the auricle or tragus. Reverdin claims that a congenital anomaly may be present in some other member or members of the family, as in the case of a man who had a supernumerary nipple on the right side of the chest. Three of his five children had preauricular appendages.

The patient whose stereoscopic picture is here presented came to the New York Eye and Ear Infirmary about November 1, 1910, complaining of profuse discharge from the right ear. Examination showed a large supernumerary auricle, about 1¼ cm. long and ½ cm. in length and breadth. The tragus was very large, at first glance looking like a second appendage. An eczematous condition of these parts and of the auricle and the canal had arisen from the profuse discharge. Examination of the drum was very difficult on account of the inflammation in the canal. The patient informed me that two more appendages had been removed in childhood and that she knew another woman in her home country in Europe who had eight of them. Her children were free from such a condition and, as far as I could asçertain, she had no other congenital defect.

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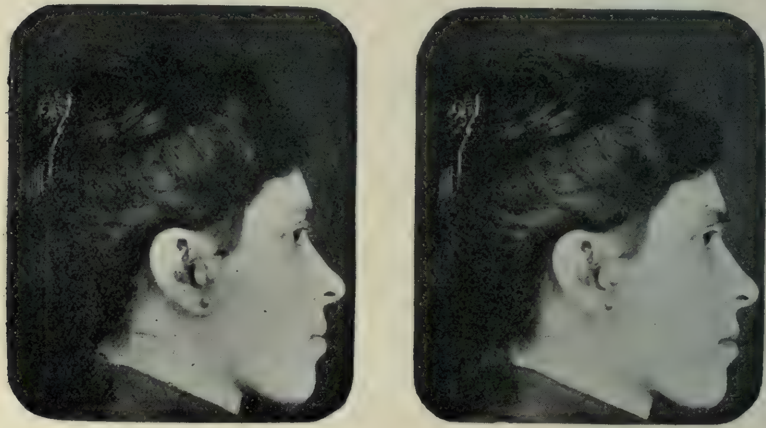
*Presented before the Hunterian Medical Society, December, 1910.



The photograph must be looked at stereoscopically to get any idea of how far out from the ear these tumors stand. I am indebted to Dr. George S. Dixon for his kindness in making the picture.

11 West 81st Street.

LI.

CASE REPORT OF EXTIRPATION OF THE LARYNX.*

By Robert H. Craig, M. D.,

Montreal.

The patient, R. W., age 65 years, male, was referred by Dr. Robert Wilson to the laryngologic clinic of the Montreal General Hospital in June, 1907. He complained of a husky voice which he first noticed about March of the same year and which had been gradually increasing. Dr. Wilson at the time suspected commencing malignant disease and suggested to Dr. Hamilton the advisability of direct application of radium to the larynx. Examination at the time revealed fixation of the right half of the larynx with considerable thickening of the right vocal cord and the interarytenoid region, and commencing infiltration of the artyenoid cartilage. There was also a superficial ulceration of the middle third of the right vocal cord, but no limitation of movement. A small piece of the infiltrated area was removed and examination showed a chronic inflammatory growth.

The patient was placed upon antisyphilitic treatment for a period of one month without influencing the growth or character of the voice; then 5 milligrammes of pure radium sulphate were applied (2,000,000 activity) for ten minutes three times a week for a period of three months, also two applications a week of a high vacuum Liffard X-ray tube applied on either side of the larynx, with a screen of one-fourth inch sole leather actuated by a 64 plate static machine passing one-half milliampere through the tube; length of treatment 12 minutes. As no apparent benefit was derived, the patient, unwilling to consent to operation, left the clinic. He states that he was able to work for about a year. I shall here use the patient's own words in describing what occurred after he left the Montreal General Hospital Clinic:

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*Read before the American Laryngological, Rhinological and Otological Society, Boston, February 16, 1911.

"I resumed my occupation again and worked for nearly a year, during which time my throat continued to give great concern as it did not show any signs of getting better, but, on the contrary, became much worse and affected me so that I could not sleep. I lost strength, my appetite was so impaired that at last I found myself choking to death. I could bear it no longer, and consulting Dr. Robert Wilson on July 6th, he arranged for me to enter the Western Hospital on July 10th."

Upon admission he complained of sore throat, difficulty in breathing, loss of voice, and cough. I was requested to examine his larynx, and was surprised to see our old patient. Examination at this time revealed a fairly well nourished man lying in bed with head elevated, considerable cyanosis of the lips, marked inspiratory stridor, and indrawing of suprasternal and supraclavicular fossæ with each inspiration. Breath very foul, thorax well formed, lungs negative, pulse decidedly accelerated, no marked glandular enlargement or tenderness. Examination of his larynx showed complete immobility and infiltration and ulceration of the right side. There was almost complete immobility of the left half, with infiltration and ulceration of the vocal cord, ventricular band and arytenoid cartilage.

I did a low tracheotomy under cocain, and as the patient obtained decided relief, he and his friends urged a radical operation. I was rather diffident about complying with their request, on account of the extensive involvement and the age of the patient. However, on August 2nd, as he had gained considerable strength, with the able assistance of Dr. Springle, I completely removed the larynx after Gluck's method, and several enlarged glands on either side. Unfortunately ten days after the operation a fistula formed which, after several attempts, I succeeded in closing. Pathologic examination by Dr. Nichols showed the growth to be of an epitheliomatous nature. The patient in his report states that he was in perfect health after leaving the hospital except for the loss of his voice. Unfortunately seven months later he developed a left sided hemiplegia which necessitated his return to the hospital, from which he has made a fair recovery.

There are several interesting features in this case apart from the main fact of his recovery: First, the result of the application of radium. Even the infinitesimal quantity in which it was applied possibly retarded the development of the growth and assisted in preventing the formation of metastases. Second, the patient's wonderful courage and determination to live. Third, the fact that he can make himself understood without any artificial appliance.

The operation of extirpation of the larynx is a most formidable one and its gravity is such that every means possible should be resorted to before adopting such a radical procedure. In the treatment of these cases, in the future when an early diagnosis has been made, I feel that it may be wise to employ Nagelschmidt's method of diathermy, viz., a small electrode is applied to the affected area through a Killian or Jackson laryngeal speculum, the indifferent electrode is applied opposite outside. One to three seconds suffice to effectually cook the pathologic tissues. Edema has never occurred in Nagelschmidt's experience.

The fulguration spark might also be successfully applied in these cases. According to my friend Dr. Robert Wilson, one of the leading radiotherapeutists of Canada, diathermy is a more powerful and penetrating agent than the fulguration spark. I shall here read you an extract from a letter that Dr. Robert Wilson wrote to me regarding a recent experience in London:

He says: "I heard Nagelschmidt give an address before the physical section of the Royal Society of Medicine in London recently, at their rooms in Cavendish Square, illustrated by slides of cases and demonstrating the use of his apparatus, which he has designed especially to give such currents. There is no question of the heat producing properties of such a current: the experiment of cooking the white of egg in the path of the current, while leaving the surrounding albumen unaffected was conclusive. The part that interests you is that he has used this current in tuberculosis of the cords, as well as in cancer, and quoted cases: the important point being that he has never had edema of the glottis following its use. He gives the treatment in his office, and in half an hour lets the patient go home. It seems to me, therefore, an unnecessary thing to do a tracheotomy or a thyrotomy, because one can reach the seat of trouble most easily with the direct method, while the short distance between the inside of the larynx and the outside of the neck materially lessens the length of time of duration of flow of current—two to three seconds being quite enough. As to the apparatus for diathermy, it is practically a step-up transformer discharging through condensers of suitable capacity into an inductance and spark-gap, the whole so balanced as to give a current of great frequency and potential energy, and capable of being transformed into heat in its passage through the body."

Personally I consider diathermy and the fulguration spark to be effectual must be applied in the early stages of the disease. If this is done its future development holds promise of great service in the treatment of these cases. From all I can learn it appears that radium, if used, should be applied in large quantities and properly screened.

To sum up as to the treatment. In an early case where the disease is limited to one side, one could employ diathermy as described. If the glottis is much involved, a preliminary tracheotomy and thyrotomy is indicated and treatment carried out through the incision. If no improvement is observed in four to six weeks, a radical operation is unavoidable.

LII.

SIX CASES OF ACUTE SUPPURATIVE OTITIS MEDIA IN ONE FAMILY WITH REMARKS ON THE COMPLICATIONS.*

By Harold Hays, A. M., M. D.,

New York.

I desire to present these six cases for your consideration because I believe that it is unusual to find so many persons in one family afflicted with the same trouble within a period of three months. Of these six cases, four of them had symptoms of acute mastoiditis and one of them was operated upon. All of them fully recovered, and in every one of them the hearing is now fully restored.

Case 1.—This case was reported in the *New York Medical Journal,* March 4, 1911. Mr. A. H., was taken with a severe epistaxis the latter part of November, for which he was removed to the New York Eye and Ear Infirmary. The bleeding continued for twelve hours in spite of the most vigorous local and general treatment. The hemorrhage was so severe that he bled out of his left nasal duct and into the right ear, which was discovered on the fifth day when the patient began to complain of pain in this ear. For the first three days the temperature had risen to 103° and on the fifth day rose to 104.8°. There was quite a little tenderness over the tip of the mastoid, and examination of the drum showed considerable bulging, as if from a mass of blood in the middle ear. As the pain increased on the following day and the temperature again rose to 104°, a paracentesis was performed, allowing of the discharge of a considerable amount of clotted blood. The patient was greatly relieved, the temperature subsided and the mastoid tenderness disappeared. The organism causing the discharge was the pneumococcus. The patient left the hospital on the tenth day. The right ear was still discharging profusely and there was no hearing in that ear. On the following day, acute pain developed in the left ear and a perforation occurred a few hours later. He lost his hearing in that ear also. In the course of three weeks both ears stopped discharging, and at the present time his hearing is in excellent condition.

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*Read before the Section on Otology, New York Academy of Medicine, April, 1911.

Case 2.—In the early part of January, the wife of A. H., who was in the eighth month of pregnancy, developed an acute influenza. About eight days later, she was suddenly seized with a very severe pain in her left ear. Examination of the ear showed a marked bulging of the drum. The temperature was 100 per rectum. Irrigations were ordered for twelve hours, after which time a paracentesis was performed, allowing of the discharge of a serous fluid. Severe mastoid tenderness had developed, extending to the tip and to the postmastoid cells. Although there was no question of an acute process in the mastoid, on account of the patient being in the later months of pregnancy and because the process was of such short duration, it was decided to keep the patient under observation a few days longer. However the patient's condition became steadily worse, so that after another thirty-six hours it was decided to perform another paracentesis. After due consultation with Dr. Robert Lewis, I came to the conclusion that if the patient did not improve in another twenty-four hours, the mastoid would have to be opened. As no improvement did take place, a mastoidectomy was performed. The cortex of the mastoid was very hard, but as the deeper cells were reached, pus and granulation tissue were found. Posterior to the sinus was a cell as large as the tip of the little finger, filled with diseased tissue. This communicated by a small column along the inferior edge of the sinus plate, then along the anterior edge into the antrum. The mastoid was thoroughly exenterated, a wick of gauze inserted into the antrum and allowed to extend out from the lowermost portion of the wound and the wound sutured all except the lowermost angle. A dry dressing was applied.

For the first three days the patient did beautifully; but on the fourth day, the temperature rose and it was seen that an erysipelas of the face had developed (left). The area of the mastoid was not infected. The erysipelas spread gradually over the bridge of the nose to the right side. The patient's temperature was never over 102° and only one night was she delirious. On the eighth day the erysipelas disappeared and two days later the patient returned to her home. Of course during this time no more than the most necessary attention was paid to the mastoid wound and as a consequence the healing was slightly delayed. However, by the end of three weeks, the ear and wound were perfectly clean.

I might mention that on the day she was taken to the hospital an abscess developed in the other ear and at the time of the mastoid operation, a paracentesis was performed on this ear. The discharge from this ear continued for some six weeks.

About four weeks after the operation the patient was delivered of a baby boy with great difficulty. There was considerable laceration of the perineum, which was sutured at the time, after a labor lasting for four days. The day following the delivery the patient was in excellent condition; but for no apparent reason, on the next day the temperature rose to 105°. Although the delivery had been perfectly clean, a vaginal inspection was made. Neither the lochia nor the examination revealed any cause for the fever. There was some distension of the abdomen which was relieved by catharsis. The following day the temperature was still 105° and the patient began to complain of severe headache and occipital pain, particularly on the operated side, and that evening the lower angle of the wound opened and a small amount of discharge took place. On the following day some edema was felt posterior to the mastoid wound. I therefore decided to make an opening about three-quarters of an inch behind the mastoid wound and establish communication between the two. Gauze drainage was instituted and on the following day the temperature dropped to normal.

For the following two weeks the patient ran an intermittent temperature from normal to 105° every other day. She still complained of terrific headaches, but there was absolutely nothing in the mastoid region to indicate any trouble. It appeared that there might possibly be a sinus thrombosis or brain abscess. An examination of the eyegrounds was negative. I determined at this point to have a thorough examination of the blood made by Dr. George S. Dixon. His report was as follows: Blood culture, negative; red blood cells, 3,580,000; white blood cells, 24,800. The polynuclears were 83 per cent of the total differential count. There were no malarial organisms. Widal and

Ehrlich tests were negative. Of course, such a blood picture showed evidences of a pus infection somewhere; but although a most painstaking examination of the entire body was made, nothing of any import could be found. Strange to say, the day following the blood culture, the temperature fell to normal and the patient was absolutely well for five days. On the sixth day the temperature again arose to 105°, there was considerable frontal headache and a purulosanguinous discharge from the nose. Frontal sinusitis was evident and appropriate treatment instituted. From that time on the patient began to improve rapidly, and up to the present time, two months later, is in excellent health. What had caused her febrile condition no one can say definitely.

Case 3.—On the day before Mrs. W. was operated, I telephoned to her brother, a doctor practicing up in New Hampshire. On his way down here to New York he suddenly developed a terrific pain in his left ear. On his arrival his temperature was 102°. Examination showed both ear canals filled with cerumen. On removing this, a deeply inflamed bulging ear drum was seen on the left side. I performed a paracentesis under gas anesthesia that same night. He made an uneventful recovery in a short time.

Case 4.—A sister came down with her brother, the doctor. Two weeks after her arrival she developed an acute influenza, and on the second day of her illness she complained of severe pain in her right ear. The ear drum was found to be bulging and deeply injected. Twenty-four hours later it was necessary to incise the drum. The discharge was serous in character and extremely profuse. For the next few days she ran a remittent temperature, at times as high as 104°. The entire mastoid region was extremely tender, but the patient's general condition remained good, and therefore I decided to try expectant treatment. At the end of a week the mastoid tenderness disappeared entirely, but the discharge from the ear had become purulent in character and was still very profuse. Under repeated irrigations with Dr. Fowler's ear douche and the instillation of drops of boric acid and alcohol, the discharge became much less. She left the city before she was entirely well, but I heard subsequently that she had no more trouble with her ear.

Case 5.—The mother-in-law of this sister, 53 years of age, had been in the city since the latter part of December and was perfectly well. She developed an influenza the latter part of February and an acute inflammatory condition in the right ear. At first she refused any treatment and a perforation developed spontaneously. There was a profuse discharge of a mucopurulent material. The pain, however, did not subside, and she developed all the typical signs of acute mastoiditis. The mastoid tenderness was so extreme that many a time I was on the point of telling her she would have to go to the hospital to be operated, but she had such a horror of an operation that I continued to treat her expectantly. As the drainage was not sufficient, I finally prevailed upon her to have a paracentesis performed. She had become totally deaf in that ear. Her temperature had run remittently up to 102°. Under proper office and home treatment the discharge ceased entirely and today she is perfectly well.

CASE 6.—As I stated before, the baby was born about the middle of February. Although weighing only five and one-half pounds at birth, it thrived very well. But at the end of four weeks it cried all one night, and the following morning the mother noticed a discharge of pus from the left ear. The child ran a very slight temperature. The ear was kept clean and at the end of the week the discharge had ceased.

It is rather unusual to find six members of one family suffering from an acute middle ear infection. The disease seemed to be passed on from one to the other and did not develop simultaneously in all. Although four cases showed symptoms of mastoid disease, it was necessary to operate for mastoiditis in one case only, showing that conservative treatment pays. I am sorry that cultures were not made of the ear discharges except in the first case. I believe that the cases of both the doctor and the child were mere coincidences. Cases 2, 4 and 5 may possibly have been infected one from the other. I have been able to keep track of the family, and am glad to say that in every instance the patient is at present in excellent health.

11 West 81st Street.

LIII.

MUCOCELE OF THE NASAL ACCESSORY SINUSES—REPORT OF THREE CASES (ETHMOID, MAXILLARY ANTRUM, FRONTAL), WITH TABULATION OF THIRTY-SEVEN CASES.*

By Hill Hastings, M. D.,

Los Angeles.

These cases of mucocele of the nasal accessory sinuses are reported largely because of the negative nasal findings and the marked facial deformity in each case. One patient was referred on account of exophthalmos from an orbital growth, suspected to be sarcoma. The second was referred on account of swelling of the cheek and marked displacement of the teeth, believed to be due either to a sarcoma or antrum suppuration. The third case was referred on account of a "tumor" of the frontal region. In no case were there any nasal symptoms.

MUCOCELE OF THE ETHMOID.

Case 1.—F. A. R., male, resident of Texas, age 30, was referred October 30, 1908, by Dr. W. W. Richardson, on account of displacement of the eye by an orbital growth. There were no symptoms except occasional headache on the affected side. The history is as follows: Six years ago, slight bulging of the left eye was first noticed. Soon thereafter a small tumor was noticed at the inner angle of the orbit. This gradually increased without other symptoms appearing. There had been no nasal discharge, no bleeding; no obstruction, except from a septal spur which was removed about a year after the eye condition was first noticed. His vision had always been found normal; there had never been any inflammation of the eye or orbit. His past history was negative. He had never had syphilis. His general health was unusually good; weight, 140 pounds.

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*Read in part at the meeting of the Western Section, American Laryngological, Rhinological and Otological Society, Los Angeles, Cal., December 8, 1910.

Examination showed displacement of the left eye forward, downward and outward; no edema of the eyelids; pupils normal in appearance and reaction: there was no muscular paralysis, although on focussing slight faulty action of the left internal rectus was noticed. The growth showed at the inner side of the orbit; the inner canthus was bulging forward. The growth was covered in front by firm bone, apparently due to displacement of the lacrimal bone. Behind the sharp edge of bone the growth felt tense; no fluctuation. There was no redness of the overlying skin and no tenderness to deep pressure.

Nasal examination showed slight septal deflection to the left; a scar along the vomer ridge in front (spur operation); the middle turbinate was somewhat larger than normal, with two or three small polyps on its anterior end. No pus could be seen, even after prolonged shrinking. (The tissues did not seem to shrink with cocain and adrenalin as much as normal.) Postnasal examination was negative. Transillumination: Frontals large and clear; left antrum, slightly dark over its upper part; left semilunar orbital light area entirely gone (affected side); right antrum normal and orbital illumination clear.

The patient was referred to Dr. A. L. Macleish for examination of the eye. He reported the eye examination negative, except for the displacement, which he found as follows: Outward, 9 mm.; forward, 3 mm.; downward, 2.5 mm. Dr. Macleish said he believed the growth was ethmoidal and likely a mucocele. It should be stated that the patient had been examined several times and given a diagnosis of "new growth, likely sarcoma." The writer also failed to suspect mucocele until suggested by Dr. Macleish.

Operation was advised and done November 4th. The operative notes are as follows:

November 4, 1908. Operation, Good Samaritan Hospital. Curved incision in front of the inner canthus extending along the inner half of the eyebrow and downward along the side of the nose. Tissues incised down to the periosteum of the orbit; elevated outwards. Necrosed and ragged defect in the outer plate of the ethmoid, size of a finger, leads to a bony encysted mucocele of considerable extent; estimated about one-half again to twice as large as the size of a normal ethmoid labyrinth; full of fluid, serous on top, thin mucus at the bottom of the cavity. Cavity extended inward and downward on the outer wall of the nose, but without any connection with the nasal cavity; extended backward to the sphenoid and upward, communicating with the frontal. The cyst was lined by thin mucous membrane, purplish red in color. Its bony wall was egg-shell in character and showed no carious defect except that in the orbit. The capacity of the cyst was estimated at from one and one-half to two tablespoonfuls. The whole of the cyst wall was removed. After removal thorough drainage in the nose existed in as much as the outer wall of the nose formed the inner wall of the cyst. The cavity was packed with bismuth gauze, the end extending into the nose. Complete closure of the outside wound with horsehair sutures. No external drainage.

November 12th. Convalescence uneventful; leaves hospital to-day (eighth day) with collodion strip. No diplopia has been noticed.

November 16th (twelfth day). Good scar; all dressing removed two days ago. Eye has returned to its normal position toward the midline; slight downward displacement remains. Very slight edema of the eyelids remains.

November 25th (twenty-first day). Patient leaves for his home in Texas entirely well. Good scar; no nasal discharge. Eyeball is in accurate position except for very slight downward displacement. No forward displacement. The globe moves in all directions normally, except on extreme elevation there is very slight lagging.

Eye examination after recovery.—Dr. Macleish reported that there was no forward displacement, but downward displacement was 4 mm., and outward displacement reduced from 9 to 3 mm.

June 27, 1910. Dr. C. P. Hall, of Texas, kindly reported that the patient had remained entirely well; no sign of tumor or protrusion. Vision of each eye 20/15. Convergence 4″. Left eye slightly deviating. Motility of each eye perfect.

MUCOCELE OF MAXILLARY ANTRUM.

CASE 2.—Miss A. C., age 19, referred by Dr. Sidebotham of Santa Barbara and Dr. Geo. W. Lasher of Los Angeles on November 11, 1910, on account of a swelling in the left cheek and thickening of the alveolar process and malposition of the left upper teeth.

The history dates back two years. The first sign noticed was bulging of the gum above the left upper teeth (bicuspids and first molar). There was no soreness, such as from an ordinary "gum boil." Her physician lanced the gum several times; thinks there was but slight discharge. She was then sent to a dentist and the left upper first molar was removed and it was found apparently sound. The dentist drilled a hole into the antrum, and considerable discharge followed. The discharge was not like that of a "cold in the head"; was usually clear, slightly bloody at times; never any odor. Following the antrum puncture she thinks there was some nasal discharge of a similar character for a short while; never any nasal discharge before this drill puncture and none since.

The malposition of the teeth was first noticed two years ago and has not changed. The discharge through the opening in the tooth cavity continued up to about two months ago. It would at times cease; she would then force an opening by use of a syringe. The hard thickening of the alveolar process had never much changed. The cheek swelling persisted and would be most noticeable when, at times, the alveolar fistula closed. There had never been any pain in the cheek, although occasional pain in the temporal region. Her general health has not been good; referred to some abdominal trouble (ovarian), for which has recently been in a hospital.

The examination notes are as follows: There is considerable displacement of the left upper canine and first and second bicuspid teeth. The biting surfaces of the teeth are turned inward, as if from pressure outward on the roots. The alveolar process is thickened and hard, and the hard thickening extends over the anterior antral wall, completely filling out the canine fossa and the usual hollow below the molar prominence. There is no sign of the fistula in the molar tooth cavity. The alveolar mucous membrane seems normal except for capillary dilatation over the swelling.

Nasal examination proved absolutely negative; no signs of pus or polyps or hypertrophies. The nasoantral wall was not bulging. The transillumination proved negative. If anything, the left antrum was brighter than the right, and decidedly brighter about the center of the cheek. X-ray examination showed slight thickening of the shadow of the nasoantral wall, but unusual clearness of the anterior wall, and twisting of the teeth.

Attempt to syringe the antrum through the puncture under the inferior turbinate caused such severe pressure in the cheek that the attempt was abandoned. At the time the trocar was felt to have penetrated the bony wall and it was (mistakenly) believed to have entered a growth in the antrum that prevented the solution from returning through the natural antral orifice.

A diagnosis of "new growth, likely sarcoma," of the superior maxilla and antrum had been made. The writer was inclined to the same diagnosis, although opening the antrum through its anterior wall before considering an extensive resection was the procedure agreed upon by all concerned.

The operative notes are as follows: November 17, 1910. Operation, Good Samaritan Hospital. Incision through the mucous membrane and alveolar process; mucous membrane and periosteum elevated, laying bare anterior antral wall. The bony wall was found very much thinned and bulging, easily broken through by light use of chisel and enlarged with curette. Immediate gush of clear brownish amber fluid with some stringy mucus in the bottom of the cavity. The whole of the anterior wall was removed by forceps. Examination showed that the antral cavity was very much enlarged below, extending well into the alveolar process, which apparently had been hollowed out. The mucous membrane was slightly more red than normal and very slightly thicker, but did not present the usual characteristics of a suppurative membrane. The cavity was a closed cavity; there was no trace of the natural opening. The nasal wall of the cavity and the orbital wall were apparently not at all distended, only thin. The thinning and distension was confined to the anterior wall and the alveolar process. From the appearance, a diagnosis of mucocele was made. A window was made in the nasal wall after removal of the anterior end of the inferior turbinate. The antral cavity was then lightly packed, the end of the packing being brought out of the nose and also out of the alveolar wound.

February 5, 1911. The antrum packing was removed soon after operation. The discharge (clear, amber colored) gradually decreased and has now ceased. The mucous membrane of the antrum was from time to time swabbed with 10% nitrate of silver, and has become thin, pale and dry. The roots of the teeth were found dead and were amputated and filled (by a dentist). A plastic operation is to be done to close the alveolar opening.

MUCOCELE OF BOTH FRONTAL SINUSES.

CASE 3.—Since the report of the above two cases, the remembrance of a peculiar frontal sinus case which I had some three years ago caused me to review the notes of the case. Although a diagnosis was then made of chronic suppuration of the frontal sinuses, with "closed empyema," yet on looking back over the history, I believe it certainly was a case of mucocele in which the suppuration was secondary. The notes are as follows:

Mrs. B. H., age 42. Referred April 30, 1908, by Dr. Clarence Cook, on account of pain and swelling above the right eye. She has suffered with pain in the head, off and on for eight years. About five years ago the left frontal became swollen and painful; "something seemed to break"; she spat out a good deal of foul pus that dropped back into the throat. The pain in the left frontal then ceased and she remained well for two or three years. During this time she is sure there was no discharge from the nose. The pain and swelling in the left frontal then returned, the eye became badly swollen, so much so that the patient claims the sight was despaired of. The swelling over the left eye then "broke" and discharged through the eyebrow with relief of symptoms. Since then the left side of the head has been well.

The present trouble, pain and swelling of the right eyebrow, dates back two or three years. The swelling would "come and go," accompanied by severe pains in the head. At such times pain would be so severe that opiates were required. At no time during these attacks or between attacks was there discharge from the nose, front or back. She is quite sure the only time there was ever any nasal discharge was five years ago, when she spat up "considerable matter," as previously stated. About three years ago, during an attack of headache, she was very feverish; thinks she was unconscious for a few hours. General health good. Married and has ten children. She is not of a nervous temperament.

Examination.—Good health apparent. Right frontal region shows a distinct swelling above the inner end of the right eyebrow and very slight swelling of the right upper lid. The swelling is about 1 inch in diameter, bulging, moderately tense, tender to touch, skin not adherent. The swelling extends below the supraorbital ridge, which can only be felt along its outer half. Left frontal region negative.

Nasal examination.—Hypertrophy of the right middle turbinate, which is firm and red; middle meatus considerably narrowed by the swollen turbinate. No sign of pus or polyps. Left side of nose practically normal. Postnasal examination is negative, except for congestion in right middle meatus. Careful shrinking of the turbinates with cocain and adrenalin fails to show any leakage of pus. (Diagnosis was quite uncertain.)

May 1st. Re-examination showed no change except pain was less.

May 4th. Two days ago patient had a chill; was seen by Dr. Cook, who found temperature 103½. Suffered considerably. No discharge from the nose occurred. Temperature dropped to normal the following day, but the pain and swelling continued. She is now suffering much pain. The only other development is that of herpes labialis on both lips on both sides of the midline. Patient states that every time she has severe attack of pain and fever in the head there is a similar eruption on the lips. Examination failed to show any scar in the left frontal (where the swelling on that side years ago is said to have broken). No involvement of the third, fourth, fifth or sixth nerves. Operation advised.

The writer was unable to make a positive diagnosis. The family physician had thought of a growing tumor and had considered the possibility of a gumma. The history of the left side made it probable that there was pus in the right frontal..

May 6th. Operation. Right frontal opened by eyebrow incision. Its outer wall close to the inner angle showed a necrotic (?) opening, fully 2 cm. in diameter, below which the periosteum of the orbit seemed adherent. The sinus was full of yellowish green pus without odor. The mucous membrane of the frontal was thick, pulpy and red. The cerebral wall of the sinus showed about the center a small opening about $\frac{1}{2}$ cm. in diameter, where the dura was exposed. (Evidently an old opening.) There was also a perforation of the septum between the two sinuses; pus of the same character could be wiped out of the left frontal. Complete exenteration of the right frontal was done; the wound partly closed. The left frontal was then opened and treated in like manner. Its mucous membrane was thick, pulpy and red; no dura exposed. On neither side could a probe be passed into the nose; the frontal duct seemed entirely closed. With difficulty an opening was made into the nose on the right side.

The diagnosis seemed to be closed empyema of the frontal sinuses.

Microscopic examination of the pus by Dr. E. L. Leonard showed small diplococci, probably "diplococcus catarrhalis."

May 20th. Patient discharged from hospital.

June 6th. Convalescence uneventful. Has had some postnasal discharge. Patient is quite positive she had never had discharge like this from the throat or nose before operation except at the time mentioned five years ago.

September 1st. Left frontal entirely healed.

October 10th. Both frontals healed, with a depressed scar on each side.

This third case was at the time a confusing case and, as above noted, a diagnosis of "closed empyema" was made. I now believe it was a case of mucocele in which the septic inflammation was secondary.

REMARKS.

These three cases of mucocele were interesting and are reported, not only because of their comparative rarity, but also on looking up the literature of the subject, it seems that mistaken diagnoses, as in these cases, have not been at all unusual. It is noteworthy that sarcoma was strongly suspected in two of these cases. The absence of nasal symptoms and the presence of marked deformity no doubt have been responsible for the diagnosis of "new growth" in many cases similar to my own.

Etiology.—A review of the reported cases of mucocele fails to find an adequate explanation of the cause of this rare condition. Turner's instructive paper is probably the best on the subject. He says the etiology is still uncertain; that probably the best explanation is the existence of a catarrhal process that has blocked up the normal nasal ostia. Yet, in some of the reported cases the ostia have been found to be open. Turner found that in 21 out of 22 ethmoid cases he reviewed the age was less than 30. Yet, in Stewart's case (frontal) the age was 62 and in di Santo's case (frontal and ethmoid) the age was 60.

Diagnosis.—Of the 40 cases here reviewed (including the three cases above reported) it is noteworthy that mistaken diagnoses were not uncommon, sarcoma, osteoma or "new growth" being often suspected. As a rule, there was no nasal discharge and frequently nothing abnormal to be seen by intranasal examination. The external signs point to a slow growing tumor.

The tumor, as a rule, shows up at the inner angle of the orbit; is tense, often surrounded by a thick bony margin; fluctuation cannot, as a rule, be detected. The displacement of the eyeball is rather constant, and yet seldom is the eye affected. (Case 1 is typical; yet in Knapp's case there was blindness in both eyes.) Diplopia and epiphora occasionally are present. The skin and overlying tissue is normal, unless secondary septic infection has occurred. The length of time the tumor and eye displacement have been noticed is remarkably long in some cases (see the tabulated review of these cases). The amount of facial deformity that occurs is interesting. In Moure's case (diagnosed "sarcoma") the mucocele had forced the nasal bones upward and apart. The same was true of the case reported by Sibileau.

In the writer's second case (mucocele of the antrum) the alveolar process had been hollowed out and forced outward; the teeth had been rotated, the roots forced outward with the biting surfaces turned markedly inward. In spite of such evident pressure changes, the nasoantral wall, as seen by intranasal examination, was absolutely normal. There was no bulging to be seen either in the outer nasal wall nor in the floor of the nose. Transillumination shows, as a rule, a light area over the sinus affected (a few exceptions). One diagnostic procedure of immense value has been overlooked by many, including the writer. It is so simple and so sure of preventing a mistaken diagnosis that it would seem almost puerile to mention it, except for the failure on the part of many to do it—namely, aspiration of the tumor. In the writer's antrum case, the naso-antral wall was punctured, as usual, to wash out the antrum. The attempt caused such a feeling of pressure and severe pain in the cheek that it was abandoned. Had the writer aspirated the antrum, the diagnosis would have been cleared up. Instead, the operation was undertaken with the fears of existence of a serious malignant disease. Others have had the same experience.

Findings.—Of these 40 cases, the ethmoid cells were affected in 20 cases, the frontal sinus in 23 cases, the sphenoid in two cases, and the maxillary antrum was found involved only in three cases (including the writer's case, Case No. 2). In the other two cases (of Bichaton) there was bulging over the alveolar process. Where the ethmoid is involved it is usually found that the labyrinth has been completely changed into one large cavity, of smooth, egg-shell-like walls. The defect in the orbital wall is in the lamina papyracæ; the lacrimal bone is often displaced forward, giving the bony feel to the orbital tumor. Behind this the tense tumor is felt. In the frontal cases, the defect is usually in the lower or orbital wall, although in a few cases the anterior wall has been "worn through." In a few cases (as in the writer's frontal case) the posterior wall shows a defect, with the dura adherent to its margin.

The character of the secretion varies from clear mucus to brownish thick gelatinous material; occasionally greenish yellow; usually odorless. In only a few cases is cholesterin reported to have been found. The secretion is usually sterile.

Histologic examination is reported in several cases. The epithelial changes were found to be variable and of no special significance; areas of columnar cells with or without cilia, interspersed with areas of flat cells. The subepithelial changes found were usually those of a mild inflammatory nature.

Operative Measures.—From a review of the histories of the reported cases, it would seem that operative success depends on establishing a large drainage opening into the nose. External incision alone seems to have been unsuccessful; recurrence following. It does not seem to be necessary to remove the mucous membrane of the sinus, as in the frontal or maxillary antrum. This is fortunate, inasmuch as prolonged after treatment and depressed scar formation (for frontal cases) is prevented.

For the ethmoid cases when the cyst is seen bulging in the middle meatus, removal of the nasal segment without external operation has given good results in the hands of some (Fullerton's case). This presents the advantage of confirming the diagnosis and radically curing the case by intranasal operative procedure under cocain. However, as in many ethmoid cases, the nose is found normal, the orbital swelling is naturally the point of attack. The whole of the cyst wall can then be removed, including the nasal segment (which establishes perfect drainage), and the orbital wound closed at once, as in the writer's case.

For the frontal cases, in addition to attacking the orbital swelling, good drainage into the nose, it seems, must be established.

For the rare cases, involving the maxillary antrum, there seems to be no reason why the usual intranasal operation, window resection in the inferior meatus, should not suffice. It is at least worth while trying before resorting to the external operation through the anterior antral wall.

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REPORTED CASES OF MUCOCELE OF THE NASAL ACCESSORY SINUSES.

	Sinus Affected.	External Signs.	Intranasal Signs.	Method of Treatment.	Findings.
.	Ethmoid.	Orbital swelling and eye displacement (three months).	Bulging of middle turbinate; no nasal discharge.	Intranasal.	One ounce grayish yellow viscid mucus.
.	Ethmoid.	Orbital swelling (three months; off and on for several years).	Bulging of middle turbinate; periodic nasal discharge.	Intranasal.	Mucopus (secondary septic infection).
.	Frontal.	Orbital swelling and eye displacement (two months). Similar swelling four years before.	Bulging of middle turbinate; no discharge.	Intranasal.	Mostly thin mucus with some thick yellow secretion.
er.	Frontal.	Orbital swelling and eye displacement (two and a half years).	Normal, except swelling anterior end of middle turbinate.	Incision two years earlier; recurrence. External operation and removed middle turbinate.	Purulent fluid. Dura found exposed. Floor of frontal and lacrimal bone gone.
er.	Frontal.	Frontal and orbital swelling. Eye displacement (four years).	Normal.	External operation; recovery in six months.	Clear, serous. Dura found exposed in floor. (Staphylococcus in cultures).
er.	Frontal.	Orbital swelling (eight years). Orbital fistula (from previous incision). Eyeball displaced.		External.	Pus and granulations (two previous unsuccessful operations; incisions and curettements).
er.	Frontal.	Orbital swelling. Eye displacement, diplopia (three months). Vision normal.	History of periodic discharge from both sides (watery). Enlarged bulla ethmoidale; no pus.		Mucus; no cells and no bacteria.

er.	Frontal.	Swelling upper eyelid (six weeks).	No nasal discharge; bulging middle meatus.	External (mucosa not removed).	Thick, slimy fluid, greenish brown (transillumination had been particularly bright). Mucosa slightly thick.
er.	Frontal.	Orbital swelling (six months). Eye displacement, diplopia.	Normal.	External.	Pus, yellowish green, foul smelling. Cocci in pairs, chains and a few bacilli.
r.	Frontal.	Orbital swelling (nine months). Eyeball displaced. Considerable exophthalmos, diplopia, Fundus normal.	Normal, history of no discharge.	External first. Later intranasal drainage.	Mostly clear, some thick white (resembles soft brain tissue). No dural exposure. Mucosa normal.
r.	Ethmoid.	Orbital swelling (one and a half years).	Negative. No discharge. Vague history of discharge, transillumination, clear.	Incised. Recurred. External and intranasal.	Mucus. No cholesterin and no germs.
r.	Ethmoid.	Orbital swelling (five years).	Hard swelling middle meatus; no discharge.	External and intranasal.	Sticky, gelatinous (not pus).
	Ethmoid.	Orbital swelling (nine years). Eyeball displaced. Orbital abscess (for four or five days).	Swollen middle turbinate; no discharge.	External and intranasal.	Pus.
	Ethmoid.	Orbital swelling (fourteen months). Eyeball displaced.	Swollen middle turbinate; no discharge.	Intranasal.	Mucus.

Sinus Affected.	External Signs.	Intranasal Signs.	Method of Treatment.	Findings.
Frontal.	Orbital swelling (eleven years). Incised and reappeared after three years.	History of discharge.		
Frontal.	Orbital swelling (following a blow, twelve years).	Nasal polyps.	External (Killian).	Mucilaginous liquid.
Ethmoid.	Orbital swelling (following a blow, ten years).		External.	
Frontal and ethmoid.	Orbital swelling involving upper lid (inflammatory frontal). Orbital swelling, at inner angle (mucocele).	Swelling of ethmoid region, filling middle meatus. History of chronic catarrh.	External.	Pus and streptococci. Staphylococci.
Frontal.	Orbital swelling.			
Maxillary sinus.	Facial asymmetry; small tumor over the premolars, covered with normal mucous membrane. Transillumination, dark.	Obstruction nasal fossa.	External incision. Speedy recovery.	Mucus with some pus.
Maxillary sinus.	Hard swelling in canine fossa, covered with normal mucous membrane.	Hard swelling of floor of nose.	External incision.	Brownish purulent material. Mucous membrane pale and thin.
Ethmoid.	Orbital swelling (six years). Eye displaced; vision normal.			Mucus, cholesterin crystals, white and red blood cells.

Ethmoid.	Enlargement of the root of the nose. Exophthalmos (slight). Vision normal.	Red, smooth tumor, causing elevation and separation of nasal bones; sarcoma suspected.	Resection of nasal bones.	Mucoid material (sterile).
Frontal.	Exophthalmos. Orbital tumor, in vault of orbit.		External, without removal of frontal sinus mucous membrane.	Coffee colored mucoid material; some pus.
Frontal.	Orbital tumor (several years).		External.	Thick, dark orange colored; red and white blood cells and cholesterin.
Frontal, Ethmoid.	Orbital tumor (three years). Frontal tumor (one year).	Soft, smooth, red tumor.	External (after intranasal puncture.	Greenish yellow.
Sphenoid, Ethmoid.	Exophthalmos. Orbital tumor. Diagnosis of retrobulbar tumor had been made, and operation advised against.	Tumor in nasal fossa.	External and nasal opening.	Grayish liquid.
Frontal.	Large orbital tumor.		External.	Mucilaginous.
Ethmoid (left).	Swelling of root of nose; nasal bone (left) raised.	Soft tumor, red, 2 c. m. from vestibule. (Diagnosis of sarcoma.)	Resection of nasal bone and process of superior maxillary.	Colloid mucus.
Ethmoid.	Orbital tumor. Exophthalmos; diplopia; lacrimation. Diagnosis of suppuration, osteoma or myxosarcoma.	Negative.	External.	Large amount grayish material.

y	Sinus Affected.	External Signs.	Intranasal Signs.	Method of Treatment.	Findings.
	Frontal.	Orbital tumor (four years).		External (frontal curetted).	
	Ethmoid.	Orbital tumor (four years). Slight exophthalmos.		Intranasal.	Gelatinous material.
	Ethmoid.		Round tumor obstructing right nasal fossa. (First diagnosis, fibrosarcoma).	External. Resection nasal bone.	
	Ethmoid.	Eyeball displaced; orbital tumor; epiphora.	Swelling at lower edge of middle turbinate (broken into with escape of turbid fluid).	Intranasal (recovery by puncture).	
	Ethmoid.	Orbital tumor (had been diagnosed osteoma). Displacement of eyeball (five months). Vision impaired. Nerve head swollen.		External with nasal drainage.	
	Ethmoid (right and left). Spenoid (right and left).	Orbital swelling (right and left). Exophthalmos right and left). Blindness from optic atrophy (right and left).	Nasal obstruction (both sides).	External.	Large amount of brown liquid; cholesterin.
	Ethmoid.	Orbital swelling. Exophthalmos.	Negative.	External.	Mucopus liquid.

LIV.

THE ANATOMY AND PHYSIOLOGY OF THE SALIVARY GLANDS.*

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When I received an invitation to introduce the Symposium on the Salivary Glands, I knew it was not on account of any original research that I could bring to this society, but rather to introduce the framework for the more practical part of this Symposium. The anatomy and physiology of the salivary glands, as I present them, contain nothing new, but if the brief description of the salient points that I give will be found of some value, I shall feel amply repaid for my endeavor.

The oral salivary glands are divided into two groups: the more important group, the three large paired salivary glands, the parotid, the submaxillary and the sublingual, and the numerous smaller glands, which are found generally distributed in the mucosa of the oral cavity, and are to be classed in the following groups: the labial glands, in the submucosa of the lips; the buccal glands, found between the buccinator muscle and the oral mucous membrane; the palatine glands, found in the mucous membrane of both the hard and soft palates, and especially on the uvula; the molar glands, in the mucous membrane behind the last molar teeth, and the lingual glands, which are situated beneath the mucous membrane of the tongue, particularly in the region of the circumvallate papillæ and along the lateral margins.

The parotid gland, the largest of the salivary glands, is a flattened, somewhat triangular shaped structure, of a grayish yellow color, distinctly lobulated, weighing from one-half to one ounce, situated on the side of the face, in front of the external ear. It extends as high as the zygoma and as low as the angle of the lower jaw. It covers approximately the posterior third of the masseter muscle, and extends backwards to the external auditory meatus, the mastoid process and the sternomastoid muscle, and is lodged in the space between the ramus of the lower jaw and the mastoid process.

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It should be noted, when operating upon this region, that this space can be increased in size by extending the head. With the mouth open, the angle of the jaw is carried backward and the condyle forward, increasing the width of the space above and diminishing it below. In infants, owing to the obliquity of the ramus of the jaw, the space is broader in proportion. In advanced age, also, the space is broader below when the angle of the jaw projects forward.

The gland is divided into four lobes: the glenoid lobe, the pterygoid lobe, the carotid lobe, and the socia parotidis or accessory parotid gland. The glenoid lobe extends upward in the posterior part of the glenoid cavity, which it occupies; the pterygoid lobe extends forward beneath the ramus of the lower jaw between the external and internal pterygoid muscles; the carotid lobe passes behind the styloid process and beneath the mastoid process and the sternocleidomastoid muscle; the socia parotidis consists of a number of lobules resting on the masseter muscle above. It is quite separate from the gland proper, and is known also as the accessory parotid gland. It has a separate duct which empties into the duct of the parotid.

Covering the parotid gland is a strong and dense layer of fascia, which is a prolongation of the deep cervical fascia. This sheath divides into two layers, one passing over and the other internal to the gland. The internal layer of the fascial sheath is deficient between the internal pterygoid muscle and the styloid process, admitting the extension of the parotid gland to the lateral pharyngeal wall. The deep fascia of the neck sends beneath the gland a process continuous with the stylomaxillary ligament, which separates the parotid from the submaxillary gland.

The parotid gland is important not only on account of its function, but on account of the relation it bears to the surrounding parts and the important structures found within the substance of the gland. These structures are, from without inward: 1, the facial nerve with its cervicofacial and temporofacial branches; 2, the temporomaxillary vein; 3, the superficial temporal vein; 4, the internal maxillary vein; 5, the posterior auricular vein; 6, a branch from the temporomaxillary vein to the internal jugular vein; 7, the external carotid artery and its terminal branches, the temporal and internal maxillary arteries; 8, the great auricular and auriculotemporal nerves.

The relation of the surrounding parts is as follows: the parotid gland is separated from the internal carotid artery, the internal jugular vein, and the pneumogastric, glossopharyngeal and hypoglossal nerves by a thin layer of fascia. By virtue of this relation, swelling of the gland, as in mumps, may cause a passive cerebral congestion by compression of the internal jugular vein. From the position which the gland holds, with reference to the temporomaxillary articulation, it follows that in severe inflammation of the gland, movement of the jaw is attended by great pain and marked interference with depression of the jaw, or involvement of the joint. The deficiency in the fascial sheath of the gland on its inner surface, between the internal pterygoid muscle and the styloid process, is at times responsible for the extension inward of pus from a parotid abscess into the temporal fossa by way of the pterygomaxillary region. Cases of retropharyngeal abscess or retropharyngeal growths of large size, may cause swelling in the parotid region, and, conversely, growths of the parotid may bulge into the pharynx. On account of the intimate relation existing between the parotid gland and the external auditory meatus, it should be borne in mind that a parotid abscess may open into the external auditory canal.

Stenson's duct, or the duct of the parotid gland, runs transversely across the face, about one-half inch below the zygoma, or in a line drawn from the lowest point of attachment of the concha, to a point midway between the free margin of the lips and the ala of the nose. It is from two to two and one-half inches in length, and one-eighth inch in diameter, and narrow at its oral end. The duct appears at the upper portion of the anterior margin of the gland, runs over the masseter muscle and bends abruptly in front of its anterior border, passes through the buccal fat pad and pierces the buccinator muscle to open into the mouth as a rounded slip, opposite the crown of the second molar tooth of the upper jaw. This orifice is from one to two mm. in diameter. This bend in the duct must be remembered when passing a probe into the duct from the mouth. The duct is formed by numerous small ducts, and it receives the duct of the accessory parotid.

The submaxillary gland is of rounded, irregular form, yellowish white in color, and weighs about two drachms. It is distinctly lobulated, the lobules being much larger than those of the parotid. It is situated in the submaxillary region, below the lower jaw and above the digastric muscle. It extends upward under the body of the lower jaw as far as the attachment of the mylohyoid muscle. It consists of two portions —a larger superficial portion, and a smaller deep portion. The superficial portion lies immediately beneath the skin, platysma and cervical fascia, the latter forming a fibrous capsule for the gland, excepting externally, where it is in contact with the body of the jaw. It grooves the inner surface of the lower jaw. It rests upon the mylohyoid, hyoglossus and styloglossus muscles. In front of it is the anterior belly of the digastric, and behind it is the stylomaxillary ligament, which separates it from the parotid gland. The facial artery grooves its deeper surface. It is in close relation with the inframaxillary branches of the facial nerve, the facial artery and vein, the lingual vein and the hypoglossal nerve. The smaller or deep portion turns around the posterior or free border of the mylohyoid muscle, and lies between it and the hyoglossus muscle.

The submaxillary or Wharton's duct is about two inches long, and has its origin in the deep portion of the gland. It is given off from the upper part of the gland and winds around the posterior border of the mylohyoid muscle, then lies on the hyoglossus muscle and passes forward over the geniohyoglossus muscle, beneath the sublingual gland, producing the sublingual fold with the floor of the mouth and terminating in a constricted opening in the floor of the mouth at the side of the lingual frenum, beneath the tip of the tongue. Near its termination it is joined by one of the ducts of the sublingual gland—the duct of Bartholin.

The sublingual is the smallest of the salivary glands. It is an elongated, flattened structure, of a white or light gray color, being lobulated like the other salivary glands. It measures from one to one and a half inches in its long diameter, and weighs about a drachm.

It lies immediately underneath the mucous membrane of the floor of the mouth, at the side of the lingual frenum, where it produces an oblong prominence distinctly seen when the tip of the tongue is raised. It lies upon the mylohyoid muscle, and is in contact on its inner side with the hyoglossus, geniohyoglossus and styloglossus muscles, the lingual nerve and the duct of the submaxillary gland. Its outer border is lodged in a depression in the body of the lower jaw, called the "sublingual fossa." Behind, it is in relation with the deep portion of the submaxillary gland, touching the other sublingual gland in the mesial plane.

This gland does not possess a common duct, but the secretion from the distinctly separated glandular components is poured out through ten to fifteen small ducts which empty into the mouth by a number of small orifices situated on the ridge at each side of the frenum. These ducts are known as the ducts of Rivinius. The anterior portion of the gland frequently gives off a somewhat larger duct, which is called the duct of Bartholin, and this either empties independently beside the orifice of the submaxillary duct or empties into it immediately before its termination.

The salivary glands are of the compound saccular or racemose variety. Each gland is enveloped in a dense, fibrous capsule, from which connective tissue septa penetrate the organ, dividing the gland into lobes. These lobes are subdivided by fibrous partitions into numerous lobules, each of which is composed of groups of ultimate saccules or alveoli. The glands are supplied by ducts, which ducts divide and subdivide into a number of smaller ducts. Each of these ultimate divisions of the ducts at last ends in an alveolus or secreting portion of the gland. Sometimes a duct ends in a single alveolus, but more commonly a duct ends in several alveoli.

Histologically the salivary glands are of two distinct groups —the serous or albuminous glands, and the mucous salivary glands. Those of the serous type are regarded as the true salivary glands, and are represented by the parotids, while the mucous type are shown in the sublingual glands. The mucoserous or mixed glands are exemplified by the submaxillary glands.

The alveoli of the glands are limited by the basement membrane, the prolongation of the smaller ducts, and are almost completely filled by irregular polyhedral granular epithelium, the narrow intercellular cleft representing the commencement of the lumen of the system of ducts. The appearance of the cells varies with the stages of secretion. When quiescent, the cells are large, their outlines indistinct, and studded with granules. During activity the cells become smaller, their outlines more distinct, and the granules disappear, especially from the outer portions of each cell. After prolonged activity the cells are still smaller, their outlines still more distinct, and the granules have disappeared almost entirely, a few only being left at the extreme inner margin of each cell. The cell substance loads itself with special products which are discharged from the cell as a part of the secretion, and the cell substance stirred up to increased growth subsequently manufactures a new supply of the product.

The old idea was that the specific activity of a gland was confined to the task of extracting certain constituents from the blood. Experiments have shown that the specific constituent of each secretion is formed in the gland itself, but the fluid secreted by a gland consists not only of its specific substance, but of a large quantity of water and solids, which water and solids may or may not be furnished by the same metabolic activity which produces the specific constituent. At all events, it is the assumption that it aids in producing the water and solids.

The blood supply to the salivary glands is very rich. The larger arteries accompany the excretory ducts of the glands within the interlobular, fibrous septa, where they give off branches which penetrate the lobular tissue, to end in rich capillary networks enclosing the alveoli. The capillaries lie immediately outside the basement membrane, in proximity to the secreting cells.

The salivary glands receive their nerve supply from two general sources—namely, from the cerebral nerves and from the sympathetic.

The parotid gland receives its fibers from the glossopharyngeal, by way of the auriculotemporal branch of the inferior maxillary division of the fifth cranial nerve. The sympathetic fibers are from the cervical sympathetic.

The submaxillary and the sublingual receive their cerebral fibers from the chorda tympani, by way of the facial nerve, and from the cervical sympathetic.

The salivary glands possess definite secretory nerves which, when stimulated, cause the formation of a secretion. This fact indicates that there must be a direct contact of some kind between the termination of the secretory fibers and the gland cells. From the larger trunks of the interlobular network, along the course of which minute ganglia occur, smaller branches enter into the lobules and extend between the alveoli to form a terminal network in contact with the cells, following thus the general schema for connection between nerve fibers and peripheral tissue.

Many interesting experiments have been undertaken to show the results from stimulation of the several nerves which supply the glands, in order to determine the exact nature of the act of salivary secretion.

Not only are secretory fibers carried to the glands by these paths, but vasomotor fibers are contained in the same nerves, and the arrangement of these vasomotor fibers is such that the cerebral nerves contain vasodilator fibers, whose stimulation causes a dilatation of the small arteries in the glands and an accelerated blood flow, while the sympathetic contains vasoconstrictor fibers whose stimulation causes a constriction of the small arteries and a diminished blood flow.

Stimulation of the chorda tympani results in a free and abundant flow of thin and watery secretion, containing not more than one or two per cent of solids, and an increased flow of blood through the glands. The whole gland is of redder hue, showing dilatation of the small arteries.

If the sympathetic fibers be stimulated, the secretion is relatively small in amount, flows slowly and is thick and turbid, and may contain as much as 6 per cent solids. At the same time, the gland becomes pale, showing that vasoconstriction has taken place. It would seem, therefore, that stimulation of the chorda tympani has the effect of promoting the discharge of water, while stimulation of the sympathetic has a marked effect in promoting the discharge of mucin. This would suggest that there are two kinds of fibers going to the glands, those called the trophic, and those called the secretory. The secretory fibers govern the secretion of water and salts, and the trophic govern the formation of the specific constituents. The cerebral nerves contain the secretory fibers, while the sympathetic nerves contain the trophic fibers.

Stimulation of the auriculotemporal produces a generous flow of limpid saliva. Stimulation of the sympathetic produces in itself little or no secretion, but when the sympathetic and auriculotemporal nerves are stimulated at the same time, the saliva which flows is much richer in solids, and especially in organic matter, than when the auriculotemporal is stimulated alone.

The flow of saliva is a nervous reflex phenomenon acting as a result of efferent impulses, affecting the secreting cells directly, while the vascular changes which occur simultaneously may assist, but they are not the direct cause of the flow.

Saliva is excreted into the mouth intermittently as occasion demands. While fasting, only a small quantity is present in the mouth—just enough to keep it moist. When food, or in fact, a body of any kind, is introduced into the mouth, a flow is produced which may be very copious. An abundant flow may result from an emotion, such as the sight or smell of food or preceding vomiting, when nauseated; and, conversely, secretion may be arrested from fear or anger. The estimated amount of saliva secreted normally, during twenty-four hours, is from one to two pints.

Atropin paralyzes the endings of the secretory fibers and inhibits the flow of saliva. Injection of sodium bicarbonate into Stenson's duct arrests the action of the secretory fibers and diminishes the flow of saliva. Pilocarpin increases the flow of saliva by stimulating the endings of secretory fibers and will remove the paralysis caused by atropin. Opium makes the mouth dry by acting on the salivary center in the medulla. The salivation by mercury is due to excessive metabolism of the gland cells themselves.

Saliva as it appears in the mouth is a mixture of the secretions of the parotids, submaxillaries and sublinguals, and the lesser mucous glands. It is a colorless or opalescent, thick and generally frothy fluid. It has a specific gravity from 1002 to 1005, with a weakly alkaline reaction. When secretion is scanty, or in dyspepsia, the reaction may be acid. Microscopically may be seen particles of food, numerous flat cells from the epithelium of the mouth, bacteria of various kinds, spores, mucous corpuscles, granules and salivary corpuscles. Saliva contains about 5 per cent of solids, 2 per cent of which are salts. The most important organic constituents of saliva are mucin and ptyalin. The mucin gives the saliva its ropy, mucilaginous character. Of the inorganic constituents, sodium and calcium carbonate are particularly abundant. There is also considerable CO_2 in solution.

Examination of the separate secretions shows that of the parotid to be clear and limpid and not viscid, for it contains no mucin. Its reaction is alkaline. It is rich in ptyalin.

The secretion of the submaxillary is more alkaline and from the mucin present is more viscid. It contains salivary corpuscles. The secretion of the sublingual is still more viscid and contains the most salts. It also is more alkaline than the secretion of the parotid.

Saliva plays an important part in digestion. Not only has saliva, through the agency of ptyalin, a digestive action on starchy food, but it fulfills other important functions. By moistening the food it softens it, and aids in mastication and deglutition. The presence of mucin doubtless serves as a lubricator for a smooth passage along the esophageal canal. By dissolving dry and solid food it no doubt stimulates the activity of taste sensation. The presence of saliva in the mouth aids materially in ease of speech.

LV.

SYMPTOMS AND DIAGNOSIS OF DISEASES OF THE SALIVARY DUCTS AND GLANDS.*

By Robert C. Myles, M. D.,

New York.

The symptomatology of the most common disease of the salivary glands and ducts, infectious parotitis or mumps, is so well known that I will not dwell upon it. The period of incubation varies from one to three weeks. The premonitory symptoms are very irregular. In one case they may be those of a very mild febrile attack, and in another those of a most profound general infection. Pain and tenderness in the parotid region frequently precedes the swelling. In the very early stages, the glands become swollen, and an edema occurs in the surrounding tissues, which produces a pale swelling in front and below the ear. The physical characteristics present a pathognomonic picture. The distress manifested when attempts are made to eat, especially anything which has a stimulating effect on the salivary glands, is one of the best differentiation tests between acute and chronic salivary adenitis. Chronic mucopurulent inflammation of the glands and ducts presents some very interesting clinical symptoms.

The writer had under his care a few years since a woman about seventy years of age, a person of very rare intelligence. She stated that she had suffered for many years from chronic inflammation of all three of her salivary glands and ducts. During the course of almost every week the ducts would become occluded, the glands, especially the parotids, would swell to a large size, and after a few days of intense agony, the ducts would become open and the intense and distressing symptoms would practically disapper. A peculiar discharge issued from the openings of the ducts. I present herewith a drawing of the microscopic findings, which demonstrates a number of eosinophiles. While she remained under my care the attacks were prevented by the systematic dilatation of the ducts, and the use of astringents and germicidal injections. I had a set of probes made for her, which she successfully used in the ducts and which, in a large measure, prevented the return of the most distressing symptoms.

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*Read at the Seventeenth Annual Meeting of the American Laryngological, Rhinological and Otological Society, June 1st to 3d, 1911, Atlantic City, New Jersey.

There is another type of symptoms which is presented in cases of chronic suppuration, with necrotic changes in the gland, especially after typhoid fever. Pus and necrotic débris issue from the ducts, and the general condition is most profoundly depressed. The case occasionally ends in death.

The most frequent disease of the salivary system is caused, in the writer's opinion, by some of the forms of socalled gouty diathesis. The symptoms vary from undefined pains beneath the tongue and lower jaw, and in the throat and neck, to localized swelling and pain in a certain gland or a part of a duct, the latter being caused by a deposit of calcareous or gouty material. These symptoms are usually transitory, and make their appearance and subside with the phenomenon of uric acid explosion.

Ranula or cystic dilatation of one of the ducts usually appears at the side and end of the tongue in the region of the ducts of Rivini and Bartholin. When not relieved by puncture or dilatation of the duct, they become so large that the tongue is forced against the roof of the mouth and backward into the oropharynx far enough to threaten the patient with suffocation. At times, a cystic cavity forms in one of the lower glands and extends downward toward the hyoid bone or backward beneath the glossoepiglottic area. Special care must be used to differentiate these from the thyroglossal cysts. Calcareous concretions present some of the most obscure and perplexing symptoms when they form within the gland. The irritation causes the gland to enlarge, and the tense, fibrous network seems to grapple the stone "with a network of steel." The symptoms of spasmodic pain and gradual enlargement terminate in an extensive and hard infiltration and, without surgical treatment, forms a fistulous opening into the mouth or externally on the neck. These extreme cases present the clinical features of cancer, and have been so diagnosed by skillful surgeons, in two cases, which afterwards came under the writer's care. Fistulæ form from wounds and injuries to the ducts and glands, and are associated with stubborn symptoms of discharge upon the external surface or into the tissues of the mouth, throat or neck.

Failure to make a correct diagnosis, in the early stages of disease of the salivary apparatus, occurs much more frequently than it should. The technic required does not seem to be appreciated as it should be. A patient will suffer for years from the gradually increasing formative process of a calcareous concretion, and be repeatedly turned away by his physicians as a neurotic crank. These salivary ducts, except those of Rivini and Bartholin, can be explored with the set of probes herewith presented. A needle, which is not very brittle, has enabled the writer to detect chalky material embedded in the gland or duct. After cocainizing, locally and hypodermatically, the needle is placed in a needle-holder, at right angles to the shaft, and made to penetrate the suspected area. The grating feeling, caused by the moving contact of the end of the needle and the hard substance, is pathognomonic. Small tumors, especially of the maligant type, should be removed at once for microscopic examination, as this is the only way that we can confirm a provisional diagnosis of cancer before it is too late. The writer has had X-ray plates taken, which, he believes, in the case of large stones, will be most valuable, although they have not as yet proved entirely satisfactory.

Microscopic and chemical tests of secretions from the ducts, glands and cysts promise much in the way of aid in making a correct diagnosis. They should differentiate between the contents of a salivary and a thyroglossal cyst, and this is extremely important, as the surgical procedure for either case would not succeed if used for the other.

Bimanual examinations have been most useful. With one index finger in the floor of the mouth and the other under the lower jaw, the size and other physical conditions of the sublingual and submaxillary ducts and glands can be approximately determined.

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LVI.

TREATMENT OF DISEASES OF THE SALIVARY APPARATUS.*

By Joseph C. Beck, M. D.,

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In discussing the treatment of the salivary apparatus it is not only necessary to understand fully the anatomy, physiology and diagnosis, but also the etiology and pathologic conditions which must be taken in account in order to comprehensively treat the subject. Since these two topics are not taken up separately in this symposium, I take the liberty of simply mentioning them when necessary. The management of diseases of the salivary apparatus, like many of the borderline subjects, is at the present time still in the hands of practitioners of various special branches, as the dentist, oral surgeon or stomatologist, general surgeon, laryngologist and pediatrician; consequently in gathering up the various opinions from these sources there are many varieties of treatment and some very contradictory statements.

The first group of conditions to be treated comprises affections in which the salivary secretions are changed in quantity and are designated as symptoms rather than diseases.

PTYALISM OR SALIVATION.

This condition, which is characterized by excessive secretion, is present in the following conditions:

1. Dentition in children.
2. Mercurial intoxication.
3. Intoxication from other drugs, as jaborandi, pilocarpin, iodin, copper, curare, lead, nicotin, physostigmin.
4. Irritation during examinations and treatment of the teeth, mouth and throat.

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5. Irritation of the chorda tympani, facial, glossopharyngeal, trigeminal and sympathetic nerves.

6. Facial neuralgia in diseased teeth and ears.

7. Diseases of the nervous system, as bulbar paralysis, postdiphtheritic paralysis, microcephalous and paralysis agitans; mental diseases, as grave neurasthenia, melancholia and hysteria.

8. Gastrointestinal disturbances, intestinal worms.
9. Urinary disturbances.
10. Sexual disturbances in men.
11. Blood diseases, as severe anemia and chlorosis.
12. Pregnancy.
13. General tuberculosis.

The treatment must be directed primarily to the cause; however, some general mode of treatment can always be instituted. In the first place the skin must be made to act as well as the other emunctories, as kidneys and intestine, by laxatives, diuretics and diaphoretics. Large quantities of water should be given and massage friction of the skin is very helpful.

To control the secretion, opium or morphin, chloral, bromids, atropin or belladonna, valerian, antipyrin and cocain have been employed with more or less success. Locally, painting the surfaces of the mouth about the outlets of the glands with pyoctanin, 1-1000, as well as other astringent mouth washes, as alum, tannic acid, glycerin, are advised. The diet should receive the strictest attention, as such patients lose rapidly in weight from the constant loss of fluid. Besides they may have gastrointestinal disturbances on account of the material interference with the conversion of the starchy food. Starchy food should be withheld to a marked extent.

APTYALISM—DRY MOUTH OR XEROSTOMIA.

In this condition we have a marked deficiency of the secretion and this may be unilateral or bilateral. It is found under the following circumstances:

1. Poisoning from atropin, diuretin, nicotin, arsenic, cocain, acids and alkalies.

2. Paralysis of the facial and sympathetic nerves.

3. In cases of marked diuresis, as diabetes mellitus, diabetes insipidus, chronic Bright's disease.

4. Hysterical diuresis and following severe fright and shock.
5. Very high temperature.
6. In severe sweats.
7. Severe diarrhea, as cholera, colitis, etc.
8. Obstructions to the outlets of the glands, as strictures, stones and tumors.
9. In very old people, when a gland has atrophied, and following a violent suppurative destructive process of the glands.

Like in ptyalism, the treatment must first be directed to the cause and only symptomatically may we assist some of these conditions. The use of irritant drugs to the salivary apparatus, as rhubarb, tincture spilaulis, tincture pyrethri, are recommended. The galvanic current by the use of a fine silver probe, introducing one pole into the opening or duct and the other to the cervical region or salivary gland, has been found of service. Internal administration of pilocarpin for a long period is reported to be of benefit.

PAROTITIS EPIDEMICA.

This is a manifestation of a specific infectious disease otherwise known as mumps and usually self-limited; most of the symptoms disappear in two weeks. It may at times be complicated by abscess in the gland, affection of the testes or knee joints. Very interesting is the parotitis secondary to orchitis in the male, and ovarian disease or oophoritis in the female.

The other salivary glands may also be involved in these affections.

Treatment.—Pilocarpin is considered a specific. Local application of ice, tincture of iodin, iodoform and ichthyol collodion. If abscess forms, early incision is imperative.

SIALODOCHITIS.

Acute infection of the ducts and glands. (Tumor salivalis.)

This condition is frequently seen following acute stomatitis in acute infectious diseases; there is a stoppage of the openings and larger ducts with mucofibrinous plugs and very small seeds, as from poppy, blackberries and raspberries. It may be complicated by suppuration.

The treatment is prophylactic. The mouth should be kept in good condition, free from such foreign bodies. If they enter, then it is necessary to dilate the opening and express whatever blocks the duct. This is followed by the relief of the symptoms of distention. There are recurrent attacks which must be treated the same way in order to prevent suppuration, cyst formation, or abscess.

ACUTE SUPPURATION OF THE SALIVARY GLANDS AND DUCTS, ABSCESS.

This condition frequently follows the acute infectious diseases of the severer forms, particularly typhoid fever, scarlet fever, measles, pneumonia, erysipelas, puerperal sepsis, pyemia, small-pox, cholera. Again after ovariotomy severe cases have been observed.

Salivary calculi, dental caries with periostitis of the lower jaw, necrosis of the temporal and parietal bone, chronic otorrhea are frequently the cause of an acute suppuration in the salivary glands.

Treatment.—As in the simple inflammation, the prophylactic treatment of the mouth is very important during the height of the acute infectious disease. Attention should be directed to the chronic conditions present which have been mentioned. As soon as abscess is formed it should be incised and drained or permanent fistula may result externally. In the incision of an abscess in the parotid, it must be remembered that the facial terminal branches may be injured, resulting in permanent facial paralysis; also that the blood supply is very much greater in the parotid than the other salivary glands, and that hemorrhage and thrombosis particularly are possible complications.

PHLEGMONOUS INFLAMMATION OF THE SALIVARY GLANDS.

As a complication to severe infectious diseases and violent acute inflammation of the mouth there occurs such rapid involvement of the salivary glands that they may break down very rapidly and rupture spontaneously externally or within the mouth. The treatment is moist dressing externally, local application of iodin externally as well as the mucous membrane, and early opening of the fluctuating area. These cases are invariably followed by fistula.

LUDWIG'S ANGINA.

This is still looked upon by some authors as a violent cellulitis of the neck, which is primarily an infection of the salivary glands. Of course the treatment is directed to the primary source of infection about the mouth and throat.

SIMPLE CHRONIC HYPERTROPHY.

Most frequently met with in the parotid gland following a severe attack of acute inflammation or associated with chronic lead poisoning. Fatty infiltration into these glands has also been observed. The treatment is by means of massage of the glands, but is usually of very little benefit.

CYSTS AND RANULA.

These conditions may be due to various causes, each requiring different treatment, consequently the causative factors will be considered primarily.

If calculus be the cause and is small, then one may dilate the punctum and express the stone through the natural opening, although this is rarely to be accomplished. More frequently incision is made over the stone and it is removed, either allowing the fluid to drain off and the wound to heal by itself or suturing up the duct.

In case the obstruction is due to a firm plastic exudative plug and obstruction of the outlet, persistent dilatation and expressing the fluid may be followed by a cure; however, this, like the cystic formations following cicatricial obstruction, requires more radical treatment. In the cases where the duct has been converted into a large thick sack, it is necessary to resect a good portion of its firm fibrous wall and establish a new outlet. It is well to employ the cautery, making a good incision and keeping it open by a sound until healing has taken place, the margins of the opening becoming covered by epithelium which cannot close up again. Placing of a silk suture through the entire thickness of the sack close by the natural opening, tying the same very firmly so as to produce necrosis of the tissue within the suture, has been followed by permanent relief. In the case of the sublingual cyst formation it is best to remove the entire cyst, which can be done through the mouth, unless this cyst communicates with the thyroglossal duct, when an external operation is required in order to prevent recurrences. In those cases the entire gland is best resected or persistent fistula with infection may be present.

Sometimes the cyst is incised and the margins are sutured to the mucous membrane of the mouth so as to establish a permanent opening.

The injection of a solution of iodin, zinc chlorid and carbolic acid into the cyst wall has also been successfully employed; they are especially recommended in cases where the parotid gland is involved, since operation about this gland is frequently followed by facial paralysis and hemorrhage, with sepsis and permanent fistulæ. If one is compelled to operate on a cyst of the parotid gland, it should be done by blunt dissection, rapidly as possible with incisions in the direction of the course of the facial nerve trunk, namely, horizontally and below the lobule of the ear.

In the case of cyst of the submaxillary gland it is not so difficult, for one may operate from the floor of the mouth or below the lower jaw without injury to any vital structures. even the extirpation of the gland may be performed with comparative ease. Long persistent cyst formation in the glands has been followed by atrophy with secondary absorption of the cystic fluid, an ideal condition to wait for, if statistics could bear this fact out and if secondary infection with abscess and fistula formation did not take place.

There is a form of ranula which has nothing to do with the salivary apparatus, namely, a cyst of the mucous glands; this is therefore not to be considered in this paper.

RECURRENT ENLARGEMENT

of gland without any apparent permanent pathologic condition.

Following the formation of fibrous plugs, which are easily expressed by manipulation, the symptoms entirely disappear. There is a case on record without the presence of these plugs and any other obstruction, claimed to be due to a spasmodic action of the duct near its outlet.

AIR TUMORS IN THE SALIVARY DUCTS.

From excessive blowing up of the cheeks, air enters these ducts and forms a crepitating swelling which rapidly subsides when a small probe or canula is passed into the openings and gentle massage toward them is performed. In one case incision was necessary to let the air out.

CHRONIC GRANULOMAS OF THE SALIVARY APPARATUS.

Actinomycosis, lues and tuberculosis in any stage are very rare and the treatment is based on the general principles of these affections. The one chronic granuloma quite frequent in the glands is the simple chronic infection associated frequently with stone or fistula, and this subject will be treated under a separate part.

NEOPLASMS.

The most frequent benign neoplasms found in these glands, especially the parotid, are the chondromata. Mixed tumors, as myxochondroma, fibromyxochondroma, are next in frequency. In the malignant, the carcinoma is more frequently found than the sarcoma, and when present it is usually of slow growth while confined above the deep firm capsule or fascia of the parotid. Pathologically it belongs to the scirrhous types. In the case of the sarcoma, it is usually admixed with the above mixed forms.

In regard to the management of neoplasms, we must consider (1) benign growths, (2) operable malignant growths and (3) inoperable malignant growths.

1. *Benign Growths.*—If located in the sublingual or submaxillary glands, it is best to remove the gland with the tumor, since the operation is thoroughly facilitated and complications such as infection, fistula, recurrence and malignancy are prevented. When located in the parotid gland, the procedure should be the attempt to remove the tumor without removal of the gland, on account of the location of the facial nerve within it. If some of the fibers of this nerve are within the tumor, then an attempt should be made to dissect them in order to prevent paralysis of that particular branch.

As previously stated, in all operations on the parotid the incision should be made horizontally, parallel to the course of the root and branches of the nerve.

It is recommended that a tongue shaped flap be made with its base toward the zygoma as far down as the angle of the lower jaw, in order to thoroughly expose the socia parotidis.

In regard to neoplasm of the ducts and puncta, the attempt should be made to preserve as much as possible of the mucous membrane of the mouth in order to re-establish as nearly a normal passage as possible.

2. *Operable Malignant Growths.*—The same rules apply to the malignant growths of the glands, except that if there be any associated enlarged lymph glands they should be thoroughly removed. In the parotid gland it is imperative in the removal of the malignant growth to preserve the parotid fascia, which is a part of the deep cervical fascia; in fact, rather to allow a portion of the tumor to remain, for when once its fascia is permeated rapid metastasis and spreading occur. In case of malignant disease of the ducts, wide excision is recommended, with subsequent X-ray treatment.

3. *Inoperable Tumors.*—Once the deep structures have become involved and secondary metastasis formed the removal of the growth can only be palliative and should be done to relieve severe pressure pains. Usual palliative measures should also be employed, as morphin, X-ray, etc.

SUBLINGUAL GLAND.

(a) Internal method. This may be attacked through the mouth, lifting the tongue, separating the mucous membrane along the floor of the mouth from one side to the other across the frenum. This will expose both sublingual glands. The tumor is then completely exposed, and if suspected to be malignant, or if both glands appear to be involved, both should be romoved.

(b) External method. An incision is made along the lower border of the lower jaw two inches on each side of the symphysis menti. The skin and subcutaneous tissue are dissected downwards, exposing the geniohyoglossus muscles, which are severed, thus exposing the gland and tumor. The same rule applies as to removal of one or both glands as laid down in describing the internal operation.

SUBMAXILLARY GLAND.

This region is best exposed by the external route. A curvilinear incision with its convexity downward is made from the angle of the lower jaw to the symphysis menti, the lower point being on a level with the hyoid bone. This flap is dissected up, exposing a triangle formed by the two bellies of its digastric muscle and lower border of lower jaw. It is necessary sometimes to ligate and sever the facial vessels, although they may simply be retracted. The muscles of the floor of the mouth are now cut, when the gland and tumor will be exposed, dissected and removed. The muscles are then reunited.

PAROTID GLAND.

This technic has been mentioned above, but attention is again directed to the fact that the operation should be limited to the tumor and only that portion of the gland which can be removed without danger to the facial nerve or deep fascia.

CALCULI.

In regard to prophylaxis and preventive treatment, one should have a clear idea as to the etiology of this affection. It is claimed that primarily there is an infection of the ducts, secretions becoming inspissated and deposits of calcium salts occurring. Therefore thorough hygiene of the mouth and teeth, especially in cases of simple stomatitis and that associated with infectious diseases, is necessary. There is nothing in the literature that I could find regarding a solvent, general or local, for these calculi. If a calculus is small and located in the duct, one should attempt to dilate the punctum, eventually introducing some sterile oil or glycerin and expressing the stone through the natural opening of the duct. Again, the punctum may be incised under local anesthesia to facilitate this expression. Probably a more rational and oft practiced method is the incision of the duct over the stone, removing it through this incision by means of forceps and either allow the opening to heal by itself or to insert a suture. Should one or more calculi be located in gland proper, then an attempt should be made to remove it through the mouth if in the sublingual, and externally if in submaxillary or parotid, by incising where stone is felt, in order to prevent infection and fistula. When the stone in the gland has existed for a long time and has caused infection with secondary abscess formation, removal in the case of sublingual and submaxillary glands has been recommended. However, in the parotid the same rule holds as given in considering neoplasm, namely, removal of stone and drainage.

SALIVARY FISTULA.

Some of the important causes of fistula have already been mentioned, as abscesses, cyst, neoplasm, stones and traumatism.

There is one particular cause of fistula that I would like to mention, namely, that produced in performing facial anastomosis. This is due in many cases to faulty technic in using sharp retractors when pulling the gland forward.

The failure of the fistula to heal spontaneously is due to the pathologic change in the formation of an epithelial lined tract communicating between the secretory gland and the skin.

Owing to the difficulty of curing this condition many methods have been devised, but I shall mention only those which in my experience and judgment give the best results.

In treating salivary fistula one must consider, first, those of the gland proper, which may be of either the parotids, submaxillary and sublingual, and second, those of Steno's (parotid) duct. Of the latter we must consider again whether the fistula is in that part of the duct between the gland and anterior border of the masseter muscles or beyond it.

In the cases of persistent salivary fistula of the sublingual and submaxillary glands, which, after all the causes, as strictures, stones, etc., have been removed, fail to close after cauterization, they should be eradicated by the removal of the glands. The technic has already been described in the subject of tumors.

In fistula of the parotid it is possible only to cauterize or remove that portion of the gland which does not contain any facial nerve fibers.

Fistula of the Duct.—Fistulæ from one of the subbranches deeply located or of the duct itself as far as the anterior border of the masseter muscle, must be closed by cautery or partial resection of the gland, since the reestablishment of a communication with the distal end or turning inwards into the buccal cavity is impossible and impracticable. Fistula due to the affection of the distal end gives much more promise for a cure.

An ideal method is to dissect the distal and proximal ends of the duct, freshening the edges and reuniting them. It is, of course, necessary in all cases to see that the passage of the distal end is free and unobstructed. When the distal end appears too short to be united with the proximal, the mucous membrane of the buccal surface may be incised in a crescentic manner in front of the papilla, which will permit approximation.

The dilatation of both ends of the duct and the placing of two fine threads of catgut within the lumen from papilla to the gland will tend to make the saliva flow into mouth and permit closure of the fistula.

Dissection of the duct about the fistula for some distance, attempting to suture about the fistula so as to close the duct and then covering over defect by a suitable skin flap from the cheek is also recommended.

When the proximal end is long enough to be dissected as far as the masseter muscle, then this should be done and carefully sutured into the mucous membrane of the buccal cavity, making the course of the saliva in that direction. The cheek wound may be left to heal by granulation or freshened and sutured, eventually being closed by a plastic flap.

One of the most satisfactory methods to close a fistula is as follows: Pass a double armed silk or wire suture, employing straight needles, from without inwards about the opening of the fistula and let the two ends come out on the inner buccal surface about one-eighth inch apart. By drawing and tying this suture firmly together, all the tissues within it will slough and will turn the fistula inwards. The sloughing channel becomes covered with epithelium. The old site of the fistula is freshened and permitted to close.

Another similar method is to pass a small trocar end canula from the fistula through the cheek obliquely forward and downwards. Remove the trocar end, passing some small India rubber tubing within the canula. The canula is now removed, leaving the rubber tubing for a week or two. The outer as well as the inner ends of this tubing are daily cut off so that the fistula may be closed, making the saliva run along the rubber tubing until a permanent channel is formed, when the tubing is left out.

CASE REPORTS.

CASE 1.—Acute Toxic Parotitis. Mr. O., 34 years old, had a Hunterian chancre five years ago, and was subsequently treated with antispecific remedies. While taking about sixty grains of potassium iodid three times daily for about a week, he suddenly developed a double facial paralysis, for which condition he was referred to me by Dr. Lieberthal.

Examination.—The facial expression was that of a frozen face; he could not move a single muscle on both sides of his face supplied by the seventh nerve. His conjunctivæ were markedly injected and there appeared to be a lack of salivary flow. Some swelling of both parotid glands, and some difficulty in opening the lower jaw. There was absence of any central or ear lesion to account for this facial paralysis, as well as the absence of any involvement of any other cranial nerves. The chorda tympani was not involved.

Diagnosis.—Acute edema, or inflammation of both parotids, with compression of the facial nerves, most probably due to the potassium iodid. The patient recovered within two weeks after withholding the iodids and the application of a mild galvanic current.

CASE 2.—Recurrent Swelling of Parotid. Mr. H. very frequently, eight to ten times a year, has swelling of the face on one or the other side, followed by chills and fever, and a tense feeling which finally terminates in severe shooting pain about the ear. This condition has been present for the last four years.

Examination During Attack.—On the left side of the face, in the parotid region, is a swelling that is greatest between the angle of the jaw and mastoid tip. The mouth cannot be opened except partially. There is no evidence of pathologic condition in the mouth, but the site of the papilla of the duct appears dry. Attempt at expression of the duct is followed by some thick secretion and some saliva. Cocain and adrenalin and dilatation with sounds are followed by more saliva, but no evidence of any stone.

Treatment.—At first the same procedure was employed in diagnosis, as cocain and adrenalin, expression of the duct and the introduction of sounds prevented the full development of an attack, but subsequently even sounding became unnecessary by the following procedure: As soon as the patient had the feeling of inability to open the mouth freely, he was directed to use a very hot mouth wash of salt solution, then gentle massage of the Steno's duct, and the application of a solution to the punctum of cocain, two per cent, in adrenalin 1-1000. Last year he had only one attack requiring instrumentation.

CASE 3.—Recurrent Swelling of Parotid. Mrs. C., 48 years of age, has symptoms of the menopause. For the past six months about the time that she should menstruate she has a bilateral swelling of the parotid glands, and at one time the one submaxillary gland was also swollen. Aside from the discomfort of a swollen face, she has no inconvenience from this trouble. In two or three days the entire swelling disappears, regardless of local application or general treatment. The flow of saliva does not seem to be interfered with.

CASE 4.—Ranula. Emma L., 4 years old, was brought to me with a history that during the past two weeks a swelling had developed under the tip of the tongue, more on the left side. This swelling was constantly increasing, causing the child considerable difficulty in speaking, and since the child was a mouth breather, she had some difficulty in breathing. It did not appear to cause the child much pain.

Examination shows a poorly nourished child with bad teeth. On the floor of the mouth, under the tip of the tongue, more prominent to the left, was a smooth swelling about the size of a walnut. It caused the child to hold its mouth wide open and the tongue was displaced upward. The tumor felt tense, but was not painful on pressure. It looked somewhat inflamed. The openings of the sublingual and submaxillary glands could not be made out.

Diagnosis.—Salivary ranula of the left sublingual gland.

Treatment.—The procedure was surgical. Under general anesthesia an incision was made transversely under the tip of the tongue, carrying it farther on the left side. This incision went through the mucous membrane alone until it came upon the cyst wall, which was very carefully guarded from puncture. The mucous membrane was very carefully dissected, and the cyst exposed. In the attempt to free it from its firm attachment to the gland, it ruptured, and a viscid, brownish fluid escaped. The sac was now thoroughly removed and the wound sutured. The result was uneventful.

Case 5.—Salivary Retention Cyst. Mr. Robert W. Following the scaling treatment of salivary deposits by his dentist, he developed a very sore mouth, and a few days later he noticed a swelling under his tongue on the left side. This swelling very rapidly increased, so that in twenty-four hours it almost filled up the entire left side of his mouth. He had great difficulty in swallowing, and very much pain of a lancinating character.

Examination.—The man had the appearance of considerable prostration, not having been able to take any nourishment for two or three days. A fusiform swelling filled up the entire left side of the floor of the mouth. Considerable tenderness on pressure, and all the mucous membrane has an acute inflamed appearance. The papilla is prominent and swollen, but no saliva comes out nor can it be expressed. He has a temperature of 100°. After cocain and adrenalin application, an attempt was made to pass a fine probe through the natural opening, but it was impossible to do so.

Diagnosis.—Acute stomatitis and plastic closure of the submaxillary outlet, with secondary retention of secretion in the form of a cyst.

Treatment.—Through the entire thickness of the swelling a small incision was made and the retained saliva let out. The relief was immediate, but this opening closed and the symptoms rapidly reappeared. The natural opening could not be reestablished, consequently at the site of the previously formed incision the actual cautery point was introduced and an opening made about one-sixteenth of an inch in length. This did not reunite again, and the patient had a rapid recovery.

Case 6.—Abscess of Parotid. Baby, three and one-half years old, was brought to the clinic on account of a painful swelling on the left side of its face. It had had the mumps a few days before, at which time both sides of the face were very much swollen.

Examination over the parotid region disclosed a swelling about the size of a walnut, which was extremely tender to the touch, fluctuating, and very much injected. Some lymphatic enlargement on the left side of the neck was noted. Temperature, 108° F.

Diagnosis.—Secondary abscess formation in the parotid gland following severe mumps.

Treatment.—Horizontal incision over the fluctuation and blunt opening up of the abscess, when about one dram of thick pus escaped; a cigarette drain was introduced, and within ten days the abscess was healed without any salivary fistula having formed.

Case 7.—Salivary Calculus. Mr. B., 27 years old. Referred by Dr. Taylor on account of a swelling on one side of the face below the lower jaw, which swelling would not disappear by the simple expectant treatment for a period of two years. It was frequently diminished, but following slight pains radiating towards the neck and shoulder, it would increase to a larger size.

Examination.—In the submaxillary region was situated a swelling the size of a hen's egg, freely movable, and not very tender. The outlet of the duct appeared normal. Passing of the probe revealed no obstruction or stone, and a normal flow of saliva followed the removal of the probe. Elevating the tongue and placing a specially cut celluloid photographic film covered by the usual yellow postoffice paper in the floor of the mouth and taking a radiogram, revealed a calculus within the gland. Another radiogram, glass negative, on the side of the neck, confirmed the diagnosis.

Treatment.—Incision through the mucous membrane of the mouth, exposing the submaxillary gland, showed, the stone located in a pocket close to the beginning of the duct. Incising over the site of the stone, it was removed and not sutured. The greater portion of the mucous membrane wound was sutured. There followed a marked reaction in the cellular tissues of the neck with subsequent abscess formation. This had to be opened externally, resulting in a salivary fistula that took seven weeks to heal.

Case 8.—Neoplasm of Parotid. Marcella De M., 8 years old, had a swelling on the side of her face for about one year, which in the past few weeks had taken on a more rapid growth. It also interfered with opening the mouth to the fullest extent.

Examination.—In the parotid region there appeared to be a tumor the size of a large walnut, not tender to the touch. There was no change in the salivary secretion from Stenson's duct. X-ray negative.

Diagnosis.—Neoplasm or cyst.

Operation.—An incision from behind the ear below the lobule and forward and upward on the face. Dissecting the skin from the parotid, it was found that the gland was not pathologically changed. Working from above downward, it was possible to separate the parotid from a tumor that had its own distinct fibrous capsule, and which was intimately connected with the ramus of the lower jaw and the masseter muscle. The tumor was removed, although not completely, and the wound closed; healing by primary union. The histologic examination proved it to be a leiomyoma or a nonstriated muscle tumor. Some facial paralysis resulted, but this subsequently disappeared.

CASE 9.—Salivary Fistula. Mrs. S., following a radical dissection of tubercular glands of the neck, a part of the submaxillary salivary gland was accidentally removed, and salivary fistula resulted. This refused to heal after several months of cauterization of all sorts. It finally became necessary to extirpate the submaxillary salivary gland, and a cure followed.

CASE 10.—Salivary Fistula. Mr. C. Following the facial nerve anastomosis for cure of facial paralysis, a salivary fistula resulted from the manipulation of the parotid gland by the use of sharp retractors which should not have been used. Daily application of twenty per cent nitrate of silver solution was followed by the closure of the fistula in three weeks.

CASE 11.—Salivary Fistula. Mr. John L. Following an encounter in which he was stabbed and cut about his face, there resulted a salivary fistula, which failed to heal spontaneously, and local application of nitrate of silver, etc., had no effect. Attempts were made to find the two ends of the duct for suture, but owing to the infiltration this was impossible.

Treatment.—A fine wire suture was passed through the fistula into the mouth and twisted firmly, to cause sloughing of the tissues contained within it. In ten days' time the suture was loose enough to be removed, and the external fistula closed.

Endotheliomata are neoplasms that have a tendency to develop in the salivary glands, especially the parotid. These invariably develop into malignant growths.

LVII.

FIBROMA OF THE NASOPHARYNX, WITH REPORT OF FOUR CASES.*

By W. B. Chamberlin, M. D.,

Cleveland.

True fibromata of the nasopharynx are rare tumors, few such cases, as a rule, falling to the lot of any one operator. Ingals, of this society, in a rather careful review of the literature, has reported more cases than any other single observer.

These tumors have their origin from the dense fibrous tissue covering the basillar process of the occiput, the middle lacerated foramen, the under surface of the sphenoid, the first cervical vertebra and the sphenopalatine fossa. Escat, of Toulouse, however, agrees with the view of Jacques, that the origin of all such tumors is primarily nasal, the most frequent site being the articulation of the vomer with the sphenoid, and that the involvement of the nasopharynx is in all cases secondary. He considers the contrary view as due to the fact that the cases as a rule are seen late in the disease or on the postmortem table, when the primary focus can no longer be made out. This view is not held by other observers.

They are hard, dense tumors, richly supplied with blood vessels, and possessing a decided tendency toward rapid growth. Extension is usually in the line of least resistance, though they do not hesitate to invade or erode any tissue, however dense, which may interfere with their growth. The soft tissues of the neck and face, as well as the nose and its accessory sinuses, are frequently involved; while the growth, if unchecked, ultimately invades the skull cavity itself. These tumors are nonmalignant in that they do not form metastases. From their location and because they so frequently invade

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important structures, they are exceedingly dangerous to life and demand destruction or removal. The base of attachment is always broad, though the tendency to form adhesions makes it difficult at times to distinguish where the origin really is. The nourishment, however, is always from the point of original growth and attachment. Frequent and severe hemorrhages are common.

According to Zarniko, nasopharyngeal fibromata consist histologically of dense fibrous tissue with elastic fibers intermingled. Although cells are, as a rule, scarce, there are frequent nests of new formed fibrous tissue rich in cells. The differentiation from fibrosarcoma is frequently difficult. Blood vessels are frequent and often of great size. This description coincides with the histologic findings in the four cases presented.

A striking peculiarity is the fact that the overwhelming majority of those afflicted are males, and between the ages of 10 and 25 years. After the age of 22 or 25 these tumors tend to spontaneously disappear, so that this period is spoken of as the age of immunity.

It is rare that a surgeon has the opportunity of seeing these cases in their incipiency, as medical aid is not summoned until more or less distressing symptoms arise. Among the earliest symptoms may be mentioned nasal obstruction and the resulting voice peculiar to it. The anemia is striking, if bleeding has been frequent. As a result of the obstruction the nose is filled with secretion, which is often of foul odor. Dyspnea, dysphagia and deformities of the nose or face belong to the later developments of the growth; while neuralgias may result from pressure on the branches of the trifacial nerve. Involvement of the middle ear is not uncommon. Death results from the anemia due to frequent hemorrhages or from meningitis as the result of the extension into the skull cavity.

The diagnosis in advanced cases is usually easy, from the appearance of the patient. On examination of the nose nothing is at first seen but thick mucopurulent secretion. If the growth is small, one side of the nose may still be free. On removal of the secretion one observes a pale red or pink tumor, very resistant to the probe and often bleeding easily on slightest manipulation. Examination may even give rise to a severe hemorrhage. On looking into the mouth the growth, if large, can be seen pushing the soft palate forward and extending downward well into the pharynx. Smaller growths are recognized with the postnasal mirror, while their consistency may be determined by digital examination. The exact point and extent of the attachment can in most cases scarcely be determined. As a rule, only the under surface of the tumor can be seen with the mirror, while the growth fills the space so completely that palpation gives little further information.

Fibromata of the nasopharynx must be differentiated, in the first place, from pseudonasopharyngeal polypi. These are the ordinary mucous polypi, so frequently met with in the nose, which have slipped back into the nasopharynx and found there greater room for development. An intermediate stage between the mucous polyp and the true nasopharyngeal fibroma is the fibrous polyp which springs from the margins of the choanæ and the tissues immediately adjacent thereto. In consistency, as well as on histologic examination, it closely resembles the true fibroma. In practically all the reported cases this differentiation from the fibrous polyp is not clear, all fibrous tumors of the nasopharynx being classified in one group, whether they be sessile and arise from the nasopharynx proper, or pedunculated and have their origin from the posterior boundaries of the nasal cavities. This differentiation, however, seems logical in that the prognosis as well as the operative procedure varies decidedly with the character of the tumor. Zarniko calls attention to the following points in the differential diagnosis: (1) The pseudo as well as the fibrous polyp is always pedunculated, the pedicle usually small—the true fibroma almost never. (2) The latter bleeds easily and spontaneously—the former never. (3) The tendency to rapid growth and erosion of neighboring structures is far greater with the true fibroma than with the mucous or fibrous polyp.

The differential diagnosis from sarcoma presents greater difficulties. Both bleed readily, and both involve neighboring structures; sarcoma by extension, fibroma from pressure. Microscopic examination of excised portions must here be resorted to. Fibromata, too, give no glandular involvement, while the enlargement of the cervical glands in sarcoma may be a striking feature. The histologic examination of an excised gland in doubtful cases may serve to clear the diagnosis.

As before mentioned, these tumors, while nonmalignant in the restricted sense, are exceedingly dangerous to life and demand destruction or removal on account of their location and their tendency to invade important structures by pressure. Lincoln in his exhaustive article, published in 1883, well summarizes the objects of treatment as: (1) The removal of all growths, as far as possible, together with destruction of tissue at the point of origin. (2) The avoidance of accident at, or immediately following the operation. (3) The securing of the least possible external deformity.

The dangers are (1) shock at the time of operation, and (2) hemorrhage during the operation or immediately after. The former danger has been largely minimized or removed by improvements in technic.

Treatment is in all cases entirely surgical and may be divided into the conservative and the socalled radical treatment. The former, or a modification of it, is the treatment practically universally in vogue to-day; while the latter was the practice of the older surgeons, especially those of England, Germany and France. We find no less an authority than Doyen, however, quoted by Delavan, asserting that "he never saw a tumor which could not be removed through the natural passages." In defense of the older surgeons it may be said that the cases seen by them were frequently more advanced, while those seen by the rhinologist to-day are usually in the earlier stages of growth. Dieffenbach, quoted in Koenig's Surgery, in speaking of these growths, says: "Great courage is required to undertake this operation, because the surgeon is almost compelled to choose between one of three conditions: (1) Choking to death during the operation, (2) bleeding to death, (3) not finishing the operation." Certainly such dangers as these are largely eliminated by the technic in use at the present time.

The radical operation involved a preliminary tracheotomy with subsequent removal of the maxilla or other bones of the face. The resulting deformity was frequently frightful, while deaths on the table or shortly after were not uncommon. Above all, the liability of recurrence was in no way minimized by such heroic measures. Lincoln, choosing arbitrarily the years 1867 to 1883, inclusively, could find only 58 cases reported in literature with 74 operations, three of those reported being his own. In those cases operated by removal of the bones of the face, over 25 per cent died on the table or shortly afterward. There were frequent recurrences. Delavan collected 120 cases in the years 1891 to 1901. In those cases operated by the older methods there was a mortality of 25.9 per cent, with recurrences in 15.4 per cent. In 66 cases operated by the modern method there was not a single fatality. For this change in operative procedure, with its resulting decrease, humanity is indebted in large part to modern specialism.

The modern operation consists of the removal of the growth, when possible, through the natural passages, the nose and the mouth. This procedure is successful in the vast majority of cases. Where the view is insufficient, or when the accessory cavities of the nose are involved, additional space may be secured by splitting the soft palate, removing portions of the hard palate, or by a Denker operation immediately preceding the removal of the tumor. Injections of monochloracetic and trichloracetic acid, as well as electrolysis and galvanocauterization, have also been successful in the hands of many operators. These latter measures may also be used subsequent to the removal of the major portion of the tumor with scissors, forceps, and the hot or cold snare. The inclusion of a sessile tumor within the bite of a snare is, however, a matter of extreme difficulty. It is frequently impossible. For this purpose the method and forceps suggested by Ingals are most ingenious, if the hot snare is used. The forceps of Stucky can be used with advantage when evulsion is attempted.

If one accepts the classification of Zarniko, only cases 1 and 4 would belong to the true nasopharyngeal fibromata. Cases 2 and 3 were distinctly pedunculated, and would therefore belong to those classified as fibrous polypi.

Case 1.—George R., age 21; farm hand. First seen in October, 1908. Complained of increasing nasal obstruction for an indefinite period. The voice was nasal in character, and there was considerable loss of hearing. Examination through the nose showed on both sides a hard, firm mass in the nasopharynx, with apparently no involvement of the nasal cavity.

Examination of the nasopharynx showed a large, pale red mass practically filling the cavity. Its point of origin could not be determined. On palpation this mass was of extremely firm consistency and was not freely movable.

October 25, ether anesthesia. Patient in the Trendelenburg position. Mouth held open with Whitehead gag with tongue depressor attachment. The tumor was attacked with scissors and strong postnasal forceps. A large piece was evulsed with profuse hemorrhage. This was controlled temporarily by packing, when on examination with the finger a second and larger mass was defined. The second mass was quickly evulsed in the same manner. The resulting hemorrhage was frightful, but was ultimately controlled by a postnasal tampon. The condition of the patient was now alarming, necessitating application of heat and infusion on the table. After return to the ward recovery, though slow, seemed at first uneventful. The packing was removed on the third day with no sign of hemorrhage. On the morning of November 6th, twelve days after operation, the patient was up and was examined with the mirror and very carefully with the finger. There was no resulting hemorrhage. Several hours later the house surgeon was hastily summoned to the ward to find the patient almost in extremis. The nasopharynx was again packed and the hemorrhage quickly controlled. The packing was removed on the third day, no hemorrhage resulting. Nine days later, or twelve days after the second hemorrhage, another severe hemorrhage occurred, making the patient's condition indeed critical. The hemorrhage was controlled by packing by Dr. Fox, the house surgeon, but subsequent hemorrhages during the night necessitated repacking with larger tampons. The day following the right common carotid was ligated by Dr. C. A. Hamann, the nasopharynx still being packed. Packing was removed on the third day with no further bleeding. Recovery was slow but steady, and the patient was discharged February 12th. He was seen by Dr. Fox in December, 1910. His health was excellent, and he had gained 40 pounds in weight.

Case 2.—Boy, aged 17. Complained of left nasal obstruction for past year—some deafness, but no history of suppuration. On nasal examination a dense, firm mass was seen blocking the left nares and encroaching somewhat upon the right. The mass was readily seen with the mirror, and on palpation was firm and resistant, but very freely movable. It was easily removed under ether anesthesia by the cold wire snare—the snare being introduced through the nose. The tumor mass was distinctly pedunculated, the pedicle being small. Recovery was uneventful.

Case 3.—Laborer, aged 28. Complained of complete obstruction of the right nares and partial obstruction of the left for past eight months. During this period the voice had been markedly nasal in character. A snap shot diagnosis of nasopharyngeal fibroma was made from the patient's voice and facial expression. On examination of the right nares much thick, purulent secretion was removed, after which a dense, pale red tumor mass was seen projecting forward from the nasopharynx. There was no mass visible on the left. With the postnasal mirror the growth was readily seen at about the level of the soft palate. On palpation it was hard, firm and apparently pedunculated. This case passed out of my hands and was later operated by a colleague, Dr. I. A. Tripp, to whom I am indebted for the following. Removal was accomplished by means of evulsion through the mouth, a Peters snare being used. The origin was evidently from the middle turbinal, a large portion of which was torn away with the tumor. This tumor measured 6 cm. in length by 4 cm. in diameter. Bleeding was profuse for a few minutes, but soon subsided. The nasopharynx was not packed. There has been no recurrence of the growth.

Case 4.—Howard P., school boy, aged 10 years. Gave a history of increasingly difficult nasal respiration for past eight months, until breathing was only possible by mouth. He was fairly well nourished, with an expression suggesting adenoids. On examination there was considerable thick mucus blocking both nostrils. On removing this and contracting the turbinals with adrenalin, a firm, resisting, pale red mass was disclosed, completely blocking the right nares posteriorly. There was some encroachment on the left side. With the postnasal mirror a growth was seen situated largely on the right side, but extending over to the left. It was smooth in contour, nonpedunculated, and apparently about the size of an English walnut. Its point of attachment could not be made out. On palpation it was firm, resistant and not movable. Operation occurred on the day following. Anesthetic and position were the same as the previous cases. Preliminary to the operation the right external carotid was uncovered and two ligatures placed around it, but not tied. The growth on account of its firm attachment could not be evulsed, but was removed piecemeal by biting forceps introduced into the nasopharynx through the mouth, as well as through the right nostril, the index finger of the left hand in the nasopharynx serving as a guide. All growth was removed until the nasopharynx seemed clean and free. The hemorrhage was not profuse, but the nasopharynx was packed. The ligatures on the external carotid were now removed and the wound closed, healing promptly by first intention. Unfortunately at this first operation there was considerable laceration of the soft palate, necessitating repair. Packing was removed the day following.

The patient left the hospital on the fourth day in good condition. On examination at the office some days later, while the nasopharynx was fairly free, a considerable mass was made out in the right nasal fossa. Repeated operations have been performed since—September 26th, November 21st, January 28th, and April 29th, when the last operation was performed. There have been occasional attacks of otitis media with spontaneous rupture of the membrana tympani. The ear is at present dry. Subsequent to the last operation the growth was cauterized through the right nasal fossa at weekly intervals. Although there was some shrinkage, these attempts were ultimately given up on account of the intractability of the patient and the increasing difficulty of producing a satisfactory anesthesia. Cauterization and electrolysis under general anesthesia have not as yet been tried.

At the last operation the erosion of the sphenoid and basillar process of the occiput seemed greater than at previous times. There was also some apprehension lest the forceps at one time had entered the skull cavity. The outcome and treatment of this case are subjects in which I wish to elicit your interest. Can the patient continue to be subjected to operations four to six times a year until spontaneous resorption occurs? A so-called radical operation is out of the question. Whether the growth could be more completely removed through the added space secured by a preliminary Denker operation and whether the patient could withstand such an operation seems doubtful.

For the histologic examination on these cases I am indebted to Dr. O. T. Schultz, assistant professor of pathology in Western Reserve University. His report is as follows:

CASE 1. The stroma is very dense, due to the marked production of intercellular fibers. The stroma nuclei are narrow, compressed and widely separated. Blood vessels are numerous; most of them are thin walled and some are quite wide. The larger arteries are thick walled. In the superficial zone of the tumor the blood vessels are particularly numerous and the stroma is not so dense as in the deeper areas. The tissue immediately beneath the epithelium is rich in small lymphocytes. In the superficial portion of the tumor there are several areas of hemorrhage. The tumor shows no degenerative changes except a moderate hyalin degeneration of the thickened walls of the arteries.

CASE 2. The stroma is more cellular than that of Case 1. Blood vessels are numerous, but thin walled, not cavernous, and not so prominent as in Case 1. Several obliterated arteries are present. The stroma nuclei are numerous, spindle shaped and vesicular. Development of intercellular fibers is less marked than in Case 1. The typical fibroma structure extends directly to the covering epithelium.

CASE 3. The stroma is soft and fairly rich in young spindle nuclei. Intercellular fibers have been only very slightly developed, the tissue in general looking somewhat myxomatous. The tumor is well supplied with blood vessels, of which a few are wide, thin walled and cavernous; there are a few very thick walled arteries; most of the vessels are narrow and compressed, with numerous spindle nuclei just outside the endothelium. About some of the vessels lymphocytes are present in moderate numbers. The tissue shows no degenerative changes.

CASE 4. The stroma is very dense, like that of Case 1. The narrow condensed nuclei are widely separated by well differentiated fibrous tissue. Blood vessels are numerous and fairly prominent because of the development of their walls. Some are quite wide and dilated. The artery walls are very thick and rich in nuclei. Immediately beneath the epithelium the stroma is not quite so dense as it is deeper down.

Summary.—The four cases show the characteristic, typical, fibroma structure. Common to all are the cellular poverty and the predominance of intercellular substance, the absence of degenerative changes in the stroma, the richness in blood vessels and the proliferative changes in the walls of the larger arteries. Cases 1 and 4 are very much alike and show the greatest density of stroma, due to differentiation or development of intercellular fibers. Case 2 is more cellular than either of the two just mentioned; the larger number of nuclei is associated with a corresponding lack of differentiation of fibers. In Case 3, although the stroma nuclei are widely separated, the intervening tissue has undergone little differentiation and has an almost myxomatous appearance. None of the tumors are cellular enough to suggest the slightest possibility of sarcoma.

In the foregoing cases I realize that I have contributed little that is original. The use of the Whitehead gag with tongue depressor attachment and the Trendelenburg position I have not seen referred to in the literature. Both I consider a decided advantage. The Trendelenburg position furnishes an excellent survey of the field and certainly reduces to a minimum the possibility of aspirating blood into the larynx or trachea.

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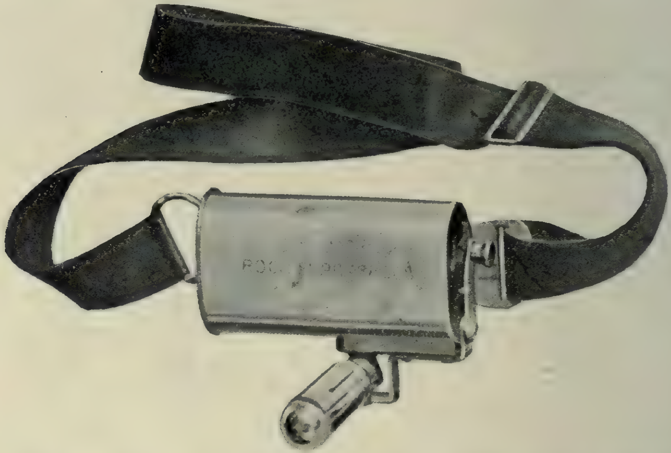
SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Meeting of April 14, 1911.

Vest Pocket Head Lamp.



Dr. Harold Hays. This midget headlamp (see cut) was presented as a practical light which could easily be carried in the vest pocket. It is portable, compact, simple and inexpensive. The complete instrument ready for instant use measures three by one and one-quarter by one-half inch and weighs only five ounces. The brilliant illumination obtained from this little lamp is made possible by a carefully worked out combination of a metal filament lamp, a high efficiency battery and a strong condenser lens. By a simple adjustment of the lens the brilliancy of the field of light is intensified as its area is reduced. Since the source of light is in the same plane as the eyes no shadows are cast. For ordinary examinations the lamp is worn on the forehead. For examination of the eyes with the ophthalmoscope, the lamp is placed on the left side of the patient's head with the light facing forward. For such examinations the lamp is ideal.

The lamp consists of a battery contained in an oval metal casing supported on the forehead by an ordinary leather head band, and a low voltage, high efficiency lamp fitted with a powerful condenser lens. There is a ball and socket joint fastened to the lower side of the casing so that the lamp can swing in any direction; and being of light weight will remain at the desired angle.

Paper: Six Cases of Acute Suppurative Otitis Media in One Family: with Remarks on the Complications.*

By Harold Hays, M. D.

DISCUSSION.

Dr. Kenefick said that it was a most interesting series of cases, particularly the one that had such marked tenderness over the mastoid, which disappeared after a simple paracentesis and subsequent treatment, as it shows what may sometimes be accomplished by proper palliative and expectant measures.

Dr. Eagleton was especially interested in the case which was complicated by erysipelas after the mastoid operation. He has not heard much of it, since John Hopkins is the only hospital he knows of which denies having had a case. Excepting that one, in every hospital that he had been to there has been a larger proportion of erysipelas than occurred in hospitals devoted to general surgery.

Dr. John Horn said that he had seen only one case of erysipelas in quite a number of mastoid cases. That one occurred two days after the operation, but did not involve the side that had been operated upon. It did not interfere at all with the dressing, and the patient made a good recovery.

Dr. George E. Davis thought that there was undoubtedly a significance in regard to the infection of the series. With the exception of the brother, who developed his case on the way down, the other cases seemed to develop within ten days or two weeks after association with an infected case. It is possible that many of these cases come from an infection, and this would suggest more care of patients so affected, and isolation from others, especially in private families.

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*See page 633.

Referring to the case with erysipelas, he cited the case of an infant in the Islip Hospital, who was operated upon for an acute mastoiditis. For five days the temperature remained normal, and then shot up to 105°, and an erysipelatous patch appeared in front of the ear, which spread over the face, forehead, and scalp, the inflammation being very marked. This continued for four or five days. In the meantime, there were some intestinal disturbances, and the temperature dropped down and remained normal for four or five days; then, apparently without cause, there was a reinfection, and the eruption spread quite rapidly, and about the fourth week the patient died from the erysipelatous infection during the second attack. Dr. Dwyer saw the child, made an examination of the pus, and used the Hiss extract, but it did not have much effect on account of the feeble resistance of the patient. The baby had had an attack of dysentery a few weeks prior to the mastoiditis.

DR. DANZIGER said that there seemed to be no doubt but that the infection of influenza was the cause of the disease, but it seemed peculiar that five cases should occur in one family. There seems to be little doubt that certain families are inclined to certain diseases, which may be due to an anatomic predisposition. It hardly seemed possible that all the family should have had otitis media without some predisposing cause, which might be the arrangement of the eustachian tube, for instance. There must be some idiosyncrasy to account for it.

DR. HAYS said that they excluded their own hearing by being conscious that they could not hear a watch. In these acute cases that seems to be sufficient evidence that the hearing is in a bad condition. They appreciated their improvement in hearing in the same way. All of them could hear a watch now at a distance of twenty or twenty-four inches—which is pretty fair under the circumstances.

He had presented this series for several reasons, and was particularly desirous to hear from the members whether they thought the infection proceeded from one patient to another, or whether it was purely a coincidence. He himself thought it was more or less of a coincidence. He could understand how six members of a family could develop influenza, but it was very unusual for six members to develop otitis media.

In regard to the patient with the mastoid who ran a peculiar temperature afterward, he had hoped that some one would offer an explanation. He had seen several cases at the New York Eye and Ear Infirmary which could not be explained in any way. The patients would run a temperature from 103 to 105 for a week or so, and in one case the examination showed an enlarged spleen and some slight tuberculosis of the lung, but there was nothing that would account for the high temperature. In one instance a patient had showed a leucocyte count of 15,000, but after a short time this subsided and she left the hospital perfectly well, and they had never been able to decide what was the matter with her. In the instance reported this evening, he hesitated to believe that the patient ran a temperature of 105 every day for two weeks, on account of the small area of infection in the mastoid wound; although it broke down the second day, and there was a small oozing of mucopurulent material. Another fact might be considered: She went on for five days without temperature, and then it rose to 105 again; then it was found that there was a sanguinopurulent discharge from the nose and frontal sinus. Of course they may have been infected before, and her severe headaches may have been due to that.

These cases should be studied more carefully, and an attempt should be made to classify them in some way. Often in these mastoid cases one sees an erysipelas which cannot be directly connected with the wound. In this case the patient developed the erysipelas under the zygomatic region, and it never touched the mastoid wound at all. Of course there may be a streptococcus of a peculiar form which may give rise to an erysipelatous infection.

He had operated on another patient at the New York Eye and Ear Infirmary, the operation being followed by an erysipelas. It was afterward learned that this patient had been operated upon before, and that time also the operation was followed by erysipelas. It is possible that some patients may have an idiosyncrasy of that kind.

Paper: A Consideration of Certain Surgical Problems Presented in the Operative Treatment of Intracranial Complications Following Aural Disease.

By Wells P. Eagleton, M. D.,

DISCUSSION.

Dr. Hurd said that the paper was too able to admit of discussion. It is a very serious thing to tap the lumbar region in cases that show considerable intracerebral pressure, for it is liable to cause respiratory paralysis, as that center will be driven down through the foramen magnum by the pressure above when the pressure in the spinal canal is released by lumbar puncture. This is especially true with lesions in and about the cerebellum. The tapping of the lateral ventricle is more feasible where it can be done.

Dr. Danziger said that he had had occasion to operate upon two brain abscesses within the last 14 months, both temporosphenoidal abscesses, both favorable, with a fistula leading through the dura into the brain. The first was drained by a hard rubber tube, but encephalitis followed and the patient died on the 13th day with symptoms of meningitis. In the second one, after having read an article on a series of brain abscesses, he tried to insert a strip of iodoform gauze into the opening of the abscess. He would like to see anybody do that. As soon as the pus is emptied the cavity collapses and there is no opening left.

He thought that in both these cases it was the drainage that caused the fatal termination. The idea of not draining an acute abscess seems to give the patient a better chance than drainage.

Dr. Hays remarked that Dr. Eagleton had stated that he had been unable to decide whether he preferred ether or chloroform in these operations. He said that he did not think it made any great difference which one was used and that in many instances very little of either had to be given. He thought that the point of greatest importance in these cases was the blood pressure, and that a collapse, often attributed to the anesthetic when the dura was opened, was almost entirely due to the pressure, which often fell to sixty millimeters of mercury. It is often advisable in these operations to have an assistant who does nothing but watch the blood pressure from a sphygmometer attached to the arm, as the condition of the pulse means nothing.

Another point of importance is the control of the hemorrhage. He had seen Dr. Elsberg use a little suturing device which controlled the hemorrhage very beautifully. This is done by taking repeated overlapping sutures down to the periosteum, both within and without the line where the incision is to be made. The ends of the two sutures are left long and these ends are tied tightly together. When the operation is over, these sutures may be removed.

Dr. Davis inquired whether it would not be feasible in draining the spinal canal, when one gets the pressure effect, to devise some method of injecting normal salt solution when there is a hernia at the base of the brain—lift the brain up and the cerebellum too.

Dr. Horn said that he had seen a similar method of controlling the hemorrhage followed by Dr. Willy Meyer, and had also seen a death in his practice. He was about to operate, and the patient suddenly stopped breathing; although the pulse was going for some hours afterward and the assistants worked over the patient for a long while, yet he died. He reported a case where he had operated on a suspected cerebellar abscess. A radical mastoid operation was performed, and on the second day the patient seemed to be doing very well, but suddenly stopped breathing, and although the pulse continued for several hours, she died. The brain was removed at the autopsy, and one lobe was almost a shell.

Dr. W. M. Leszynsky said that while listening to the paper he felt that a great deal had been well said about cranial surgery, with the apparent assumption that the otologist was going to remove brain tumors and undertake general cerebral surgery. In watching operations for otitic brain abscess, it had always seemed to him that it was wise not to do any more traumatism to the skull or brain than was absolutely necessary. The customary method has been to extend the opening from the mastoid to the middle cranial fossa for a temporosphenoidal abscess, and to the posterior fossa for a cerebellar abscess. To make a large bone flap for such a purpose seemed to him unnecessary. He was aware that there was some difference of opinion on this subject. Some surgeons have suggested (particularly those who have done much brain surgery and are not so familiar with otologic work) that it is better to make a large bone flap for such a purpose. To do this properly requires much practice and special skill. He had seen the Hudson drill used a number of times. It is a remarkable instrument. He had been led to believe that there was no danger in using it, and was surprised to hear Dr. Eagleton say that unless very carefully handled it might easily perforate the dura. He had witnessed the death on the table of a patient undergoing operation for otitic cerebellar abscess. He himself had made the diagnosis, and the otologist was operating in the customary manner. Just as the abscess was reached, respiration ceased, though the pulse continued. Artificial respiration was kept up for a long time. In another fatal case that he recalled, artificial respiration was kept up over twenty-four hours. A large opening in the skull relieves the intracranial pressure, and there did not as a rule seem to be any danger to the patient in dispensing with lumbar puncture under such circumstances.

Dr. Eagleton said that he was aware that the paper was not an otologic paper, and yet if the otologist is not capable of going into the skull as well as the general surgeon, he had no business to try to treat a brain abscess. It is just that position which has been spoken of tonight which has kept otologists from doing good work in the treatment of brain abscesses of suppurating otitis media. We must remember that all we know of the treatment of abscess has come not from the otologists but from general surgeons.

MacEwan is a general surgeon, and yet his mastoid work is a part of his general surgery, and is done on the principles of general surgery. It is because Dr. Eagleton is an otologist that he feels that he should either leave brain abscesses alone, or treat them as well as it is possible for them to be treated by any surgeon.

Referring to Dr. Leszynsky's remarks, he said that the otologists as well as the neurologists have made great advances, but that many of the mistakes that he himself has made have been due to the neurologists. He has found that in the diagnosis of brain abscess there are but two classes of men who are of great assistance—the pathologist, who knows the lesion, and the surgeon who has been there and seen it. So, while he feels that otologists should pay attention to the neurologists, they should pay more attention to themselves as otologic surgeons. If the otologists still continue to explore through small openings, as we see in every hospital, making small openings through the dura, we will always have bad results.

Dr. Blackwell said that while he had been very much interested by Dr. Eagleton's paper, he also was impressed with the fact that most of the doctor's observations had a general surgical rather than an otologic bearing. He believed that the logical point of surgical procedure in these cases of intracranial complications due to aural disease was through the mastoid region, or through the original mastoid wound, rather than from a formal osteoplastic flap located at a greater or less distance above the level or behind the region of the etiologic focus of the complication.

Referring to Dr. Eagleton's remarks on rongeurs, he thought that those we had presented a sufficient variety and were good enough for all ordinary purposes, from the heavy Mathieu down to the smallest Pyle.

With regard to uncovering the sinus, it has been his custom to first remove the subcortic cells overlying that structure with a broad curette. He has such an instrument devised for the purpose, having exhibited and described its use at a previous meeting of the Section. By repeated strokes of the curette the overlying bone can be readily and rapidly reduced to the thickness of ordinary foolscap paper, when with a Pyle rongeur this parchmentlike covering can be easily removed with a minimum risk of tearing the underlying vein wall.

He had been much interested in what had been said about treating an acute brain abscess without drainage, having never heard one advance nondrainage for the acute conditions before.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

Seventeenth Annual Meeting.

Atlantic City, June 1, 2 and 3, 1911.

Thursday, June 1st.

SYMPOSIUM—DISEASES OF THE SALIVARY GLANDS.

I. Anatomy and Physiology of the Salivary Glands.*

By R. Johnson Held, M. D.,

New York.

II. Symptoms and Diagnosis of Diseases of the Salivary Ducts.†

By Robert C. Myles, M. D.,

New York.

III. Treatment of Diseases of the Salivary Apparatus.‡

By Joseph C. Beck, M. D.,

Chicago.

DISCUSSION.

Dr. James A. Babbit, Philadelphia, expressed himself as having been profoundly impressed by the papers just presented and called attention to the increasing realization within the last few years of the importance of the salivary glands. The conditions affecting these structures might be grouped under four heads: (1) Those conditions which involve the salivary glands, per se, viz., neoplasms. (2) Conditions in the oro- and nasopharynx which are secondary to disorders of the glands. (3) Defective stages of metabolism which might be of glandular etiology. (4) Latent infections, causes and effects of which through connection with most important anatomic structures, may be incident to glandular activity. He has been surprised in tracing hospital records of operations upon the salivary glands to find their comparatively limited number. Among the list were fibroma, carcinoma, lymphoma, keratoma and tumors of mixed type. In forty-five per cent of cases listed in two of the large hospitals, operative procedure resulted in facial paralysis, partial or complete.

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*See page 655. †See page 664. ‡See page 667.

Especial emphasis was given to the part which he believed to be played by the various metabolic conditions in the pathology of the salivary glands, particularly the parotid, from its size and anatomic position. He referred in this connection to the propaganda of Horace Fletcher, who, as is generally known, is an enthusiast upon the subject of "salivary digestion" and "salivary activity" as the keynote of health.

Pathologically and physiologically too much emphasis cannot be placed upon the parotid, by reason of its relation to superficial and deep cervical lymphatic nodes, proximity to jugular veins and carotid arteries, and connection with great cranial nerves, particularly the facial. It cannot but be a frequent factor in metabolic pressure and metastatic symptomatology.

Dr. Thomas Hubbard, Toledo, had seen cases of recurrent parotitis. In one the condition was proven to be due to calculus. During ten years the recurrences had taken place as often as once or twice a month. The submaxillary gland was involved. The calculus, which could be felt by means of a probe, was removed under local anesthesia, with complete relief. In another case, recurrence took place once in about six months. He had also seen a case of parotitis following appendectomy, with rupture into the external auditory canal near the tympanic ring. This occurred about ten days after the operation.

He had operated upon one case of salivary fistula of the cheek, in a child, employing a method slightly different from that described by Dr. Beck. A curved needle, with a small silver wire, was used, and the operation was performed under local anesthesia. The duct was completely encircled, and a double perforated shot was passed over the silver wire and fixed by compression. Daily twisting of the wire brought it through in a very few days. The cure was permanent. The duct was severed between the fistula and the gland, and it drained thereafter permanently into the mouth.

Referring to the etiology of epidemic parotitis, attention was called to the work of Dr. Elizabeth Herb, of Chicago, who had conducted a series of experiments. She had produced experimental parotitis by injecting into the ducts diplococci from a case of mumps. From these experiments and others, to the number of 200 or more, it would seem quite probable that the cause of parotitis has been definitely determined.

An interesting condition is emphysema of the salivary glands, caused by high tension, as obtains with players of wind instruments, glass blowers and others. Dr. Dorendorf, *Zeitschrift fuer Ohrenheilkunde*, etc., recorded cases in musicians at the post in Freiburg. Permanent dilatation may occur.

The selective action of the diplococcus, or whatever the definite causative agent may be, upon the acoustic nerve should be more carefully investigated, particularly with reference to nerve deafness. He had had four cases of labyrinthitis with permanent nerve deafness, due to epidemic parotitis. The onset of the symptoms are sudden. Two of the patients were children and two were adults. Symptoms of labyrinthitis came on suddenly in the night—nausea, vertigo, vomiting and absolute deafness. In children this is often overlooked; they are not watched carefully enough, and subjective symptoms are soon forgotten. One of these patients, the son of a physician, went several weeks before the family discovered that he was deaf. It was finally noticed by the mother that he did not answer promptly when called, and this was due to the fact that he could not locate the direction of sounds. Hearing was perfect in the other ear, whereas tests proved that it was absolutely lost on the affected side. Vertigo, tinnitus and headache were the prominent symptoms of labyrinthine invasion in this case.

Routine and thorough inquiry by otologists as to the causative relation of mumps to deafness, particularly in all cases of nerve deafness of unknown origin, is advised; and further, the duty of resorting to prophylactic measures in order to prevent this should be impressed on pediatricians. Investigation shows that from two to five per cent of the cases of nerve deafness in deafmute institutions have been caused by mumps; and more than two per cent of cases of infective labyrinthitis are due to mumps. These statistics should impress otologists that the study of the relation of mumps to nerve deafness is important.

Dr John R. Winslow, Baltimore, referred to a paper on diseases of the salivary glands, read by him about two years ago before the Laryngological Section of the Medical and Chirurgical Faculty of Maryland. Among others, two cases of salivary calculus were mentioned in that communication. One was that of a young man who had had recurrent inflammation of the submaxillary gland on the left side, for which no cause could be found. After several recurrences a small lump was discovered at the mouth of the gland, and this was clamped with a hemostat and removed by slitting the duct. It proved to be a calculus of the size of a millet seed. In other words, the cause of the inflammation was a movable calculus which, from time to time, became impacted and caused obstruction to the outflow of glandular secretion. In the other case a crescentic calculus was removed from an abscess in front of the larynx. It had formed in the parotid gland and had migrated downward in the tissue of the neck.

Dr. George L. Richards, Fall River, referring to cancer of the salivary glands, said he had made an error of diagnosis in this regard. When the supposed cancer was removed he found at the bottom of it a calculus, which was responsible for the entire condition. The general surgeon and the family physician had concurred in the diagnosis of cancer. Calculi are sometimes easy to find, and sometimes they are not. Two years ago he removed a submaxillary gland in a case in which a piece of straw was the cause of the trouble. The patient had always insisted that he had a piece of straw in the gland, it having lodged there while he was picking his teeth with the straw. He had had three cases in all. He saw Killian do an operation for calculus of the submaxillary gland in a case in which a radiogram showed the exact position of the calculus. It could not be found where it was shown to be. When practically the entire gland had been removed, it was found much higher than had been supposed. When there is swelling, coming on reasonably early, and in a person relatively young, the presumption is against cancer. In such cases calculus can usually be found.

Dr. M. D. Lederman, New York City, called attention to the fact that calculi may exist in the salivary ducts without giving rise to acute symptoms. He cited the case of a young man with a rather severe infection of the neck, resembling a socalled Ludwig's angina. He was unable to swallow, the saliva poured over his lips, his tongue protruded, and he had an elevation of temperature. Both submaxillary and sublingual glands on the left side were swollen and tender. The possibility of an infection of a streptococcic nature was considered. The patient said a year or two before he had expectorated some hard substance, but had no local inflammatory symptoms at that time. On passing the finger over the floor of the mouth a hard substance could be felt. Incision was made and a calculus, three-quarters of an inch in length, was found. This had obstructed the sublingual and submaxillary ducts. By milking the glands pus was drained through the incision. The patient made a complete recovery.

The speaker called attention to the universal habit of chewing gum, and suggested that the hyperactivity of secretion caused thereby may have some unpleasant effect upon the function of these glands.

Dr. L. B. Lockard, Denver, reported a case which he had seen a number of times through the courtesy of Dr. T. E. Carmody.

The patient, a man of twenty-four years, had had pulmonary tuberculosis for two years, when there appeared a hard swelling of the right parotid gland, which was diagnosed as mumps. After one week some softening occurred, and upon incision an ounce and a half of pus was evacuated. This contained diplococci.

Suppuration continued, and five weeks later the cavity was curetted and microscopic examination showed large numbers of tubercle bacilli, but no diplococci.

About this time the right parotid became swollen and tender, and the pus evacuated by incision contained both the diplococci and tubercle bacilli. The diplococcus was identical with the organism of parotitis.

At the end of five months there is still a purulent discharge on the right side, on the left there is nothing but saliva.

Dr. George F. Keiper, Lafayette, recommended the administration of potassium iodid in cases of dry mouth from insufficient salivary secretion. He called attention to the possible relation of bulbar paralysis to apparent increase of salivary secretion.

DR. JOHN F. CULP, Harrisburg, emphasized the fact that calculi may exist in the ducts of the salivary glands for some time without giving rise to symptoms. He had had under his care a policeman who had had trouble with one of his parotid glands for about three years. It would swell, become very painful for twenty-four to thirty-six hours, then subside. He was sure that the trouble was due to a calculus; he probed for it, but did not find it. Finally the patient came to him with a report that a hard stone had passed out of his mouth and that he was now all right. He has had no trouble since.

DR. NORTON L. WILSON, Elizabeth, reported a case similar to that mentioned by Dr. Hubby, in which abscess of the parotid gland ruptured into the external auditory canal, except that in his case it followed typhoid fever.

DR. MYLES, in closing the discussion, mentioned an interesting case in which the stone was in the submaxillary gland, and the fistulous tract opened at the glossoepiglottic fold. Immediate action was necessary in order to prevent suffocation. He thought it was a thyreoglossal cyst, but it proved to be a salivary cystic fistula. The cavity was opened and a stone removed. One should be persistent in the effort to make a diagnosis, as these patients suffer much more than might be supposed. When the stone is in the duct, spontaneous temporary relief frequently occurs. Spasm or swelling of the duct closes its lumen around the calculus, shutting in a certain amount of secretion behind the stone, and this causes great distress. When the duct is sufficiently dilated by the retained secretion, the obstruction is relieved and the discomfort subsides.

IV. Direct Laryngoscopy.

DR. E. FLETCHER INGALS, Chicago. The procedure of direct laryngoscopy has not yet come into universal use by laryngologists, the majority of whom favor the older indirect method. The reasons for this are: (1) The necessity for special and expensive instruments. (2) The difficulty of keeping the apparatus in order, especially the lighting system, when it is not in constant use. (3) The time consumed.

(4) The limitations of the method as regards certain cases. These objections far outweigh the advantages in the majority of cases in which inspection of the larynx is made, and in a large percentage of cases where operative measures are to be adopted. There are many cases, however, in which direct laryngoscopy is of great value. In persons with sensitive faces, with thick tongues, with short and thick or stiff necks, this method is often impracticable without thorough local or general anesthesia. The chief indications for direct laryngoscopy are as follows: (1) For the removal of impacted or embedded foreign bodies in the larynx, and the recovery of those that are in positions inaccessible by the indirect method. (2) For diagnosis of laryngeal conditions in infants and children with whom the indirect method cannot be employed, as in the presence of papillomata, stenoses, malformations, etc. (3) For the inspection of certain parts of the larynx or trachea that are more or less invisible by means of the mirror, and for the treatment of lesions in such localities. (4) When a better picture of a condition is desired than can be obtained by the indirect method.

The chief contraindications are: High-grade dyspnea from various causes, uncompensated heart lesions, aneurism of the aorta, myocarditis, arteriosclerosis of considerable degree, conditions causing high blood pressure, extreme weakness, severe hemoptysis.

Preparation of the patient consists in abstinence from food for six hours and from drink for two or three hours previous to examination.

The position of the patient is the upright or recumbent, the latter being better, perhaps, in children, because they can thus be held better.

The instruments required are the open tube laryngeal speculum, or long tube, with spatula end.

Atropin and morphin given two hours before the operation lessen the secretion and quiet the patient.

Edema of the larynx is to be guarded against after the operation, especially in children. Tracheotomy may be necessary. The croup tent is of value in the aftertreatment of these cases.

V. Endoscopic Treatment of Asthma.

Dr. Wolff Freudenthal, New York, referred to his efforts for the past three years in the treatment, endobronchially, of various diseases, such as chronic bronchitis, pulmonary tuberculosis, and especially asthma. The present communication dealt solely with this method of treatment in cases of socalled essential asthma, otherwise known as bronchial or reflex asthma. The etiology of this form of asthma was briefly discussed. Four cases treated by the endoscopic method were detailed, and seven others mentioned. Out of the total of eleven cases treated endobronchially, eight can be considered cured, three greatly improved, and two not benefited at all. It would appear that these data compare favorably with the results obtained by other methods.

In all the cases bronchoscopy was employed under local anesthesia, the patient being kept in the upright position. The treatments were given in the morning, the patient's stomach being empty. Some pain always followed bronchoscopy, in some cases lasting three or four days, in others only a few hours. The treatments were given repeatedly and occasionally many times before the patient was pronounced cured.

The author was convinced, from his repeated endobronchial examinations, that there are asthmogenous points in the bronchi as well as in the upper respiratory tract, and that by attacking these points directly by topical endobronchial applications the foundation is laid for a new means of combating and conquering bronchial asthma.

DISCUSSION.

Dr. Richard Hall Johnston, Baltimore, said the straight method of direct laryngoscopy is particularly valuable in infants, young children and adults, under general anesthesia. He never employs anesthesia of any kind in infants and young children, as it is dangerous up to five years of age. The method of procedure is as follows: The little patient is pinned in a sheet so that the arms and legs are practically immovable. He is then placed on the table with the head in the normal straight position. An assistant holds the head while nurses look after the arms and legs. The operator stands at the left of the table, facing the patient, and holds the modified Jackson speculum in the left hand. The mouth is forced open, if necessary, and the speculum passed straight down between the incisor teeth. When the epiglottis comes into view, the spatula end of the instrument is hooked around it. Slight pressure upward on the handle suffices to bring the larynx into view. In adults with short, thick necks, the entire larynx is sometimes not seen; in such a case an assistant is told to push the thyroid cartilage back, when in most cases the anterior commissure comes into view. When direct laryngoscopy is performed in the sitting position, the head is extended slightly and turned to the right or left. The instrument is introduced between the bicuspid teeth, the tongue pushed to the side and the epiglottis pulled forward. If the anterior commissure is not seen, the nurse is instructed to push the head forward until a straight position is assumed, when all parts of the larynx are seen. The force required to manipulate the instrument is slight.

Dr. G. Hudson-Makuen, Philadelphia, asked whether it is customary to give atropin before the operation, as suggested by Dr. Ingals. In the case just reported by the speaker, 1/200 of a grain of atropin was given. There was not a particle of secretion at the end of the tube during the operation, which lasted an hour. There was no closure of the glottis during the direct laryngoscopy preparatory to putting in the bronchoscopic tube, so that it was not necessary to wait for the larynx to open, as directed by Jackson in his book. He also asked whether the sphincter-like closing of the glottis is always noted. It was with great difficulty that he was able to remove the tube at all, on account of the spasm of the glottis. Perhaps the tube was too large for the glottis in this case. There was a very strong grip on the tube, which came out with a snap.

He asked Dr. Freudenthal whether the operations which he had described were done in his office, and whether the patients were immediately allowed to go home. What anesthetic was used in the last case? Does Dr. Freudenthal recommend a general anesthetic, and the employment of the bronchoscopic method in the treatment of asthma in nervous individuals? Does he consider this so important a method in the treatment of this condition as to warrant the giving of a general anesthetic?

Dr. B. R. Shurley, Detroit, thought some classification of cases which can be more satisfactorily dealt with by the indirect method should be determined upon. The indirect method is evidently a passing one, which he noted with some regret. Coincidental with the passing of this method, deftness of manipulation is also passing, because this method called for the nicest technic of any in the laryngologic specialty. He had recently encountered two cases of laryngeal papillomata, which he removed by the indirect method. One case was that of a man with a very small mouth cavity, where the indirect method seemed very much better than the direct. He mentioned this merely to emphasize the fact that there are still some cases in which the indirect method is preferable.

In asthma the relief in many cases is in indirect ratio to the amount of secretion which is stirred up apparently by the manipulation. Cocain will very frequently relieve the asthmatic spasm. Iodid of potassium, through stimulation of secretion, is exceedingly valuable. Asthmatic cases may be classified into those which are due to the nasal conditions, those which are of bronchial origin, and those which are entirely of systemic origin. The general use of the bronchoscope is not a proper procedure; it is necessary first to classify the cases before advocating this as a general procedure in the treatment of asthma. The bronchi can be reached by intratracheal injection as well as by the more severe manipulation necessitated by the use of the bronchoscope. Of course, it may be important to investigate by means of the bronchoscope and to determine the nature of any lesion that may be present.

Dr. George L. Richards, Fall River, referring to the question of giving an anesthetic to children in making a bronchoscopic examination, cited a case in which he came near losing a patient. The anesthetic was given and the instrument passed by a member of this society, when the child suddenly ceased to breathe. The tube was withdrawn and breathing reestablished, but the only reason for the child's being alive is that tracheotomy had already been done. No fault in technic was responsible for this unpleasant experience.

Dr. Thomas J. Harris, New York, considered tracheotomy of decided advantage. One must reckon, however, with a series of cases in which good results cannot be obtained in this way; cases in which there is a good deal of ossification of the cartilage, and where the neck is so stiff that the parts cannot be seen without a general anesthetic. In such cases, Burning's contrapressure instrument has proved of advantage. Burning himself has called attention to the use of the instrument with satisfactory results in cases of this class. By this means the larynx is pushed in at the same time that pressure is made outward.

DR. ROBERT C. MYLES, New York, said the peculiar spasm to which the trachea and the bronchi are subjected in asthma is a habit-spasm, due to the constant state of hyperemia of these parts, and a reflex central irritation. He had been experimenting for several years with tracheal and bronchial medicaments, using adrenalin, menthol, carbolic acid, iodoform, and various other agents in liquid albolen as an injection. Marked relief had been obtained at times, due either to the anesthetic effect of the drug, or to the brutalizing of the parts. In chronic diseases of the rhinopharynx and nose, great quantities of mucopus flow down the trachea and the bronchi, rendering them more or less immune to foreign agents. This is due to the obtunding effect on the mucous membrane, and this probably partly explains Dr. Freudenthal's success.

DR. FREUDENTHAL, in closing the discussion, presented some instruments used by Ephraim for anesthetizing the trachea and bronchi, and some rare books published in the earliest period of laryngoscopy in Germany.

Referring to the use of atropin, he said he usually gives it in 1/100 grain doses, but had found that it had no effect whatever upon the secretion. It is necessary, of course, to differentiate between foreign body and asthma. He had made a few of these bronchoscopic examinations in the clinic, but they were unsatisfactory. It is better to do it early in the morning, before the patient has had any breakfast.

Anesthol, to which he referred, is composed of equal parts of ether, chloroform and alcohol. As a rule he does not use a general anesthetic. He agreed with Dr. Myles and Dr. Shurley, that the bronchoscope stirs up the secretion, serving as a means of expression of the secretion which is present, and of which the patient cannot get rid otherwise.

Referring to Dr. Shurley's suggestion about a classification of cases, he called attention to the fact that he had done this in the paper. He would not, for example, employ this method in a case of uterine asthma.

Answering Dr. Barnhill's question as to how a cure is obtained, he said it is difficult to tell. Surely a single introduction of the bronchoscope could not cure asthma, unless by autosuggestion. He had used it for six, eight and ten weeks, at the same time putting the patient under better hygienic surroundings.

Orthoform or propesen emulsion are indicated where there is superficial erosion. The soreness is thus relieved, and the patient is more comfortable and does not manufacture so much phlegm as usual when the bronchoscope is introduced. In the absence of ulceration or soreness, he used adrenalin, to which he added two or three drops of oleum menthol pip.

VI. Fibrous Polyps of the Nasopharynx. Report of Three Cases, With Exhibition of Specimens.

Dr. Walter A. Wells, Washington, directed attention to a rare form of new growth, of a wholly different character from adenoids, and presented some very interesting points for consideration with respect to its origin, nature and evolution.

Fibrous polyps in the nasopharynx are comparatively rare, and should not be confused with sarcomatous growths in this locality.

A genuine fibrous polyp occurs, as a rule, singly, and is a large, firm, smooth, opaque growth, made up of dense connective tissue, and attached by a firm pedicle. It occurs almost wholly in children, and most frequently in boys. It is evidently a benign growth, never giving rise to metastasis or glandular involvement, not accompanied by true cachexia, seldom recurring, and apparently in certain cases in later life undergoing spontaneous retrogression.

The various theories concerning the origin of these growths were briefly outlined. Without attempting to decide which of the theories is correct, the author emphasized the futility and insufficiency of the mere clinical observations to decide these particulars. A report based upon a postmortem examination would be much more trustworthy than an opinion based upon rhinoscopy or digital examination.

The ultimate termination of nasopharyngeal polyps, in the absence of surgical intervention, is another subject for discussion.

Calcification, serous infiltration, cystic degeneration, sloughing, sarcomatous degeneration, atrophy and retrogression are the various possibilities. These tumors frequently grow to an enormous size, producing dilatation of the nasal fossæ, spreading of the nasal bones and resulting deformity. Posteriorly this expansion causes a forward protrusion of the soft palate and interference with its normal action. Articulation, deglutition and respiration are interfered with, dyspnea and anemia may result from insufficient oxygen, the patient may suffer from dysphagia and become emaciated, and serious hemorrhage may occur at any time. Immediate removal of the growth is imperative under such circumstances.

The methods for the removal of nasopharyngeal polypi may be classified as follows: (1) Those in which access to the tumor is obtained by some preliminary cutting operation, and the growth then removed through the artificial route thus created. (2) Those in which the tumor is treated or extracted through the natural passages, the nose or mouth.

The crude methods of treatment advocated and practiced by many surgeons are attended with serious consequences, the radical, mutilating operations are apparently unnecessary. Electrolysis, the cautery snare and ignipuncture are open to serious objections, as are likewise the various caustic agents.

The author advocated the use of a heavy wire snare, so constructed that great force can be employed. With a little ingenuity it is always possible to manipulate the wires to engage the growth close to the place of attachment, so that the tumor may be removed in toto. A clean severance of the tumor without injury to the surrounding parts, without shock, without hemorrhage and without subsequent sloughing, are the advantages claimed for this method. Recurrence is no more frequent after its use than from other methods. In three cases cited this method was successfully employed.

VII. Four Cases of Nasopharyngeal Fibroma.*

By William B. Chamberlin, M. D.,

Cleveland.

DISCUSSION.

Dr. Harmon Smith, New York, called attention to the frequency of error in hospital records with reference to the cases under discussion, many cases which are called intranasal fibromata being in reality myxomata. He recalled three cases which had been treated by injections of monochloracetic acid, two under his own direction and one under that of his chief of clinic, Dr. McPherson. All of them made perfect recoveries. Seven years ago he had modified Coffin's syringe by making the needle longer, so that the acid could be injected deeper into the tissues. He protected the needle by a jacket which concealed the point until the location for injection had been reached, when at the will of the operator the needle could be unsheathed and inserted into the tumor. When the injection had been made, the sheath could again be run into place before its removal and the cuplike end of the sheath would catch the excess of acid that might exude upon withdrawing the needle. The sheath protected the soft palate and adjacent structures against injury from the needle while in the act of reaching the tumor. It worked well. In another case with Dr. Charles H. Knight, the first attempt to remove the growth was unsuccessful. The screw of the snare broke, and for a while it seemed that they would be unsuccessful in disengaging the snare loop, but by main strength of a surgeon present the wire was drawn through the growth and it was completely removed. The case recovered. The operation was followed by considerable hemorrhage. It seemed to him to be inadvisable to do the major surgery formerly resorted to in these cases. There is just as much danger from radical surgery or from the wire loop as from the manipulation of the acid. If shock from a major operation, and the dangers of hemorrhage, can be overcome, one is justified in resorting to radical surgery.

Dr. D. J. Gibb Wishart, Toronto, said his experience with the cases under discussion is extremely limited. They do not seem to be very frequent in a northern climate. In operating upon these cases one could not afford to confine oneself to any one line of procedure. It is necessary to determine the point of origin of the growth as well as that to which it has extended, and proceed accordingly. Where the growth has extended into the sphenoid sinus, for example, or into the antrum, a different line of treatment must be followed from that employed where the growth is adherent to the walls of the nasal cavities, pushing downward. If it is in the nasal cavities, it is much more easily removed than when it has invaded the antrum or the sphenoidal cells. In the latter event, one must adopt a radical procedure. When this is necessary, it should be borne in mind that the growth must be removed in its entirety, including the pedicle. Where the growth is adherent to the sides of the nasal cavity, removal is difficult unless a part of the turbinals is also removed. In this event a procedure should be adopted which will give as little scar as possible. Even the radical operation leaves no more scar than was formerly left by other procedures. The absence of scar in a well done Killian operation on the sphenoid is remarkable, and curved incisions on the side of the nose leave very little scar. In the operation suggested by Watson Williams, which none of the speakers had mentioned, a part of the Killian incision is adopted. The side of the nose is laid open and a part of the turbinal bone removed, healing resulting without scar.

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*See page 683.

In dealing with hemorrhage in these cases, he would feel disposed to open the cricothyroid membrane and to give an anesthetic through the opening, then to pack the pharynx with sponges. He had adopted this procedure in several instances in operations on the nose where great bleeding was to be anticipated.

Dr. H. L. Swain, New Haven, had had a case similar to number four of Dr. Chamberlin's series. He had great difficulty in saving the patient, who, nevertheless, has reached man's estate without further trouble until within the past year, when he had a terrific hemorrhage. This last he also survived.

It is well known that these tumors are rare, comparatively, and very rare in young girls. The only case he had had among the latter proved to be almost identical with psammoma. No snare would cut through it. He was unable under general anesthesia to wrench it out by means of large forceps, and it bled hardly a spoonful. It was found to be very poor in blood vessels, with a great deal of fibrous stroma, very much like a uterine fibroma. In this tissue, scattered in smaller and larger masses, were the hard sandlike particles. He had tried to remove another nasopharyngeal fibroma, and he had never seen greater hemorrhage than resulted in this case, except where the longitudinal sinus was cut. Packing through the posterior nares and the injection of salt solution proved successful in saving the patient's life. In another case upon which he operated, the tumor, which was poor in blood vessels, came out very easily. These tumors vary from those which are very easily enucleated to those which are practically irremovable.

Dr. Joseph A. White, Richmond, cited the case of a boy, eighteen years of age, who had been sent to him by Dr. Robertson of Danville. The doctor had broken all his snares in an effort to remove the growth, and, becoming tired of the case, had sent it to the speaker. The patient had a typical frog face. The whole right side of the nose was filled with the growth, and the postnasal spaces were partly filled. The difficulty was to encircle the growth with a snare at all. His experience had been that no wire will stand the strain in a case of this kind. He used a No. 9 piano wire, turning the nut very slowly, but finally reached a point where it would not turn at all. He surmounted this difficulty by using an iridoplatinum wire. After cutting nearly through the growth by this means, it can be completely removed by the use of the electrocautery.

He never passes a snare through the nose, but always through the mouth. As large a loop as desired may be used in this manner. It is a very simple procedure.

We are all aware of the difficulty in passing any sizable loop through the nose to encircle the growth. To meet this difficulty he takes a very fine child's catheter and puts a wire through it, making a small twisted loop at the distal end. This is so small it can be pressed through any obstructed nostril easily. When it appears in the pharynx, he draws it out of the mouth and fastens the two ends of the wire loop to the small eye in the end of the catheter and pulls it back through the nose. He then passes the two ends of the wire through the canula of the snare, but before tying it in position he encircles the growth from the back, using his finger to put the loop in position, and when he has drawn it out over the growth he fastens the ends to the snare and proceeds in the usual way to cut through the growth.

Dr. Lewis A. Coffin, New York, described his method of using the snare tandem fashion in cases in which it had been necessary to surround the growth by a loop entered through the mouth and a stilet snare that could not be threaded sufficiently near the growth to be effective. He had slipped the canula of a second snare over the free ends of the wire, carried it well down onto the growth, and then, threading his operating snare as close up to the canula as possible, and causing the distal end of the operating snare to abut on the proximal end of the first canula, he had a very satisfactory instrument.

He had been successful in several cases with monochloracetic acid. In one clinical case Dr. McCullagh, of his staff, had removed nearly all of one of these tumors by means of a strong cold wire. Great hemorrhage followed, the patient being almost exsanguinated. The growth recurred, being apparently sessile. He suggested that Dr. McCullagh inject monochloracetic acid by means of his syringe. This was done over a considerable period of time, the growth was entirely removed, and now, after a lapse of three years, there is no recurrence. He had had other cases in which the same treatment had proved equally successful. In tumors which are cystic, the acid does not act so well. It is difficult to use the needle because of the danger of catching it on the contiguous tissues. The patient must be able to assist by holding the tongue. If the treatment can be carried out it is generally successful.

Dr. J. A. Stucky, Lexington, said since the publication of his article on this subject, seven or eight years ago, he had seen four other cases of fibroma of the nasopharynx. He had never seen a case of multiple fibroma. Three out of nine of his cases were lobulated, but none were multiple. Neither had he ever seen a fibroma which any snare would cut through. He had had Tiemann make a modification of the Jarvis snare, as long and strong as any tonsil snare, and had succeeded in getting the loop over the growth, but despite the fact that it was kept on for twenty-four hours, and that the nurse turned the nut every five or ten minutes, a point was always reached at which it would not turn. He had taken ordinary plumbers' forceps to turn it with, and every time had broken the snare. Finally, the wire had to be cut in two, the canula slipped off, and the growth ultimately removed with the forceps. He had used forceps in five cases, the forceps being a modification of the old Brandagee forceps. By tying the soft palate back he could get a good view of the growth. He then inserted the left blade of the forceps, then the right, and then locked them. With the mirror he looked to see that he had secured the growth. It is better to tie the carotid artery beforehand, but whether this is done or not, the tampon cord should be inserted through the nostril, with the postnasal tampon ready for use. The growth should be loosened, as a dentist loosens a tooth, before the attempt is made to remove it. He had found that one postnasal tampon will be sufficient, and when this is removed in twenty-four or forty-eight hours there is no secondary hemorrhage.

Dr. James F. Logan, Kansas City, emphasized the importance of a thorough pathologic examination of the growth previous to operation, in order to obviate mistakes in diagnosis. He had had six cases of nasal tumors of the type under discussion. Two proved to be fibrosarcoma. In each case the report from the first pathologic examination was nasal fibroma, and, after removal of the deeper portions of the growth, the second report was fibrosarcoma in two of the cases. The operative treatment of these two conditions is very different. For the removal of a nasopharyngeal fibroma with a pedicle, not attached to the adjacent tissues, he used a surgeon's chain ecraseur, introduced behind the growth through the mouth. In cases of fibrosarcoma or sarcoma he had made up his mind never to attempt to remove the growth by other methods than electrolysis. One case in which he removed a spindlecell sarcoma attached to the body of the sphenoid by means of morsellation and the snare, he succeeded in clearing the growth in the nose at the expense of a terrific hemorrhage, even after ligation of the common carotid. It was necessary to transfuse normal salt solution in order to resuscitate the patient. Recurrence of the growth took place within five months. He refused to operate, fearing that the patient would die on the table. He was taken to Chicago, where an operation was attempted and the patient died before its completion.

A large number of these cases occur in foreigners, principally in those from northern countries.

In two cases in which he had removed the growth by electrolysis there had been no recurrence. In each case he had made three insertions of the electric needle.

Dr. George L. Richards, Fall River, asked if it is not true that there may be a change in character from fibroma to fibrosarcoma. He had had a case referred to him as adenoids which proved to be fibroma. He used the snare in his office, with resulting terrific hemorrhage. He succeeded in stopping the hemorrhage. The patient did not return to him, but he was able to follow the subsequent history, from which he learned that the patient went to the hospital and died in the second year from malignant growth, which was doubtless fibrosarcoma.

Dr. Linn Emerson, Orange, had had a case of this kind in a child eleven years of age, who had already been operated upon for adenoids. He gave calcium chlorid before and after the operation. Under ether anesthesia he could not get the snare around the base of the growth, but by means of the largest Brandagee forceps he twisted it and got it out. Alarming hemorrhage followed removal of the growth, which was controlled by gauze and the finger in the larynx. After four months there had been no recurrence in this case.

Dr. Charles S. Means, Columbus, reported a case of nasopharyngeal fibroma which filled the posterior nares and the vault of the pharynx so completely that he could not use any instrument except the forceps. The turbinals were enlarged and the septum was deviated, so that it was impossible to see or operate through the nose. The patient was a boy fifteen years of age. Breathing was labored, on account of the obstruction, the tumor being so large it filled the pharynx and came in contact with the tongue. It was impossible to get any instrument or wire loop through the nose beneath the soft palate. He therefore seized the growth, and by force extracted it en masse. It proved to have two pedicles, and was large, smooth and very dense. The pathologist pronounced it pure fibroma. Its dimensions were 2½ inches long, 1¾ inches wide and 1¼ inches anteroposterior.

Very little hemorrhage followed the operation. There has been no recurrence, after five years.

DR. CHAMBERLIN, in closing the discussion, called attention again to the differentiation between true fibroma and fibrous polypi. Pedunculated growths do not tend to recur, whereas sessile growths do.

DR. WELLS, in closing the discussion, said he could not grasp the differentiation which Dr. Chamberlin had made between pure fibromata and fibrous polypi. The distinction is one of form rather than of nature. To distinguish them from the sessile forms, we designate as fibrous polyps such as are attached by pedicles. His own cases were pedunculated, but pathologic examination has proved that they were purely fibromatous. The pedicles were very tough and exceedingly firm.

Concerning the use of forceps, he believed the reports which had just been made, together with those in the literature, confirm the position which he had taken, namely, that such instruments are to be avoided, and that the snare is the instrument to be used in these cases. Perhaps he had been fortunate in his three cases, but he did not think there are any pedunculated cases which cannot be removed by a snare made strong enough. Any fibrous polyp which can be removed with forceps can be removed with the strong snares now in use.

VIII. Report of a Case of Optic Neuritis Benefited by Operation on the Sphenoid and the Posterior Ethmoid.

DR. HARMON SMITH, New York. Unmistakable evidences of the favorable outcome of operations upon the sinuses for the restoration or betterment of sight have been furnished by Onodi, Posey, Holmes and others. It may reasonably be concluded that in cases of optic neuritis, where all other causes have been eliminated, operation upon the sinuses will prove successful in a large proportion of cases, provided the neuritis has not extended over too long a period. In cases where the most beneficial results were obtained there was but slight local evidence of involvement of the accessory sinuses. The author considered it unquestionably justifiable to operate on these sinuses when every other possible cause of the neuritis has been eliminated, even when there is no local or intranasal evidence of the existence of an empyema. Such interference may be justified as an exploratory operation. The mere depletion incidental to the operation will in itself prove of value if the neuritis be due to the pressure of a diffuse inflammation. Pressure, either upon the nerve itself or upon the nutrient vessels supplying the nerve, will occasion visual disturbances, so that relief of pressure, whether it be due to empyema, periostitis or hyperemia from nasal congestion, is the object to be kept in view by the rhinologist. This can be promptly attained only by operation. Milder operative procedures have proved ineffectual in this regard.

The author's method of procedure is to remove the middle turbinate with the cold snare, remove the lower and anterior walls of the posterior ethmoidal cells with forceps and curet, enter the ostium of the sphenoidal sinus with a probe, and curet away the anterior wall from this point downwards, until sufficient space is made to employ sphenoidal forceps, when the entire wall can be removed, or enough of it removed to determine whether there is any necessity for a more radical exposure of the sinus. Drainage is all that is demanded in the majority of cases. If granulations exist it is better to remove them with forceps than to curet the sinus. Postoperative packing will further reduce the granulations present, as well as prevent their recurrence. In the absence of granulations, the author does not use packing, but sprinkles over the denuded area a few granules of thrombokinase, which controls the hemorrhage and does not prevent drainage. The aftertreatment consists in preventing the formation of granulations by the use of fused nitrate of silver on a probe, or cutting them off with forceps, and in keeping the nose clean by douching with some alkaline solution. The eye symptoms should begin to show improvement within a week if the diagnosis has been correct and the operation successful.

Three cases with marked disturbances of vision were detailed, each showing decided improvement in this regard.

He has operated upon a number of cases with lesser disturbances of vision, with good results in the majority of instances. In several there has been no improvement. Upon the whole, however, he felt justified in advocating operative measures for the relief of optic neuritis, in the absence of other known causes, and when there are no contraindications for operation.

DISCUSSION.

DR. LEWIS A. COFFIN, New York, said he had been interested for the past year or so in studying the visual field in the class of cases under discussion, and had had every case investigated from this point of view, as well as the fundus condition. In this connection he had read with interest a late paper by Wallis, of Edinburgh, published in the *Journal of Laryngology, Rhinology and Otology* for May, 1911. Wallis quoted Onodi as saying: "Hinkel treated twenty cases of sphenoidal suppuration without finding anything abnormal in the visual fields. * * * Contrary to the findings of Gruenwald, Ziem, Bryant, Kuhnt and Berger, Henrici and Haffner, in thirty-six cases of accessory sinus disease, found a normal visual field. These facts are to be explained * * * by the varying relation of accessory sinuses and optic nerves. There are two factors that help in the limitation of accessory sinus disease and prevent it from spreading to the optic nerves: the nerves may come into no relation with the sphenoidal sinuses or ethmoid cells, and the wall of the sphenoid may be very thick." Wallis states that "Whilst agreeing with Onodi that the varying relations of accessory sinuses to the nerves and the thickness of the sinus walls are factors to be considered in the production of field affections, I cannot concur in his anatomic explanation as the cause of these conflicting statements. It seems scarcely within the bounds of possibility that certain anatomic relations of the posterior sinuses should occur in the patients of those observers who have recorded field affections, and that certain other anatomic relations should always occur in patients of those who have not found field affections." With reference to the etiology of field affections, Wallis was quoted as saying, "Ophthalmoscopic changes are a far more common symptom in posterior sinusitis than in the anterior, as is to be expected from the close proximity of the nerve to these cavities. * * * This is explained by the assumption that the optic nerves are directly involved by a toxic substance which has soaked through into the optic canal and orbit from the sinuses."

The speaker did not agree with Wallis with reference to the soaking through of any toxic substance to the sinuses; he did not think there is any toxic principle that acts directly upon the nerve to destroy its function, but rather that this is entirely circulatory. The venous return from the anterior cells is such as not to interfere with the optic nerve, whereas the venous return from the posterior cells is such as to interfere with the venous return of the optic nerve. This gives rise to the edematous condition. This would seem to be borne out by the fact that in disease of the frontal and anterior cells there is edema of the adjacent tissues. On the other hand, there may be orbital cellulitis and edema of the orbital part of the head while the vision remains the same, unless there is great pressure. The idea of this toxic principle must be borrowed from the oculists, who have recognized and described a toxic amblyopia, attributed to alcohol, tobacco, etc.

In discussing Dr. Smith's paper, a brief report of the following case will be of interest, because the patient was not only referred to me for operation by Dr. Harry Friedenwald, but Dr. Friedenwald has kindly given me a complete history of the ocular changes as they occurred:

Dr. Harry Friedenwald's Notes.

"M. Malintourisch, a Pole (age 26), applied on November 29th, 1910, at the Baltimore Eye, Ear and Throat Charity Hospital, complaining that the left eye had suddenly become blind two weeks previously, since which time there had also been headache and some dizziness; no vomiting. The right optic disk was perfectly normal and the vision perfect. The left eye showed an optic neuritis of the choked disk variety with two diopters of elevation. The margin of the disk was completely lost, the veins were markedly dilated and tortuous, the arteries attenuated; numerous flameshaped hemorrhages. There were no other symptoms pointing to cerebral trouble and the patient was very comfortable at this time. His nose was examined by Dr. Worthington, who found distinct involvement of the ethmoidal cells on both sides. He was, therefore, admitted into the ward of the hospital and given general examination, without eliciting any further trouble. There was no history or evidence of lues."

My own notes (T. C. W.) at this time show evidence of chronic, nonpurulent ethmoiditis, and on the left side a large middle turbinate which completely fills the space between the outer wall and the septum; yellow mucus about middle turbinate.

Diagnosis.—Bilateral hyperplasia of the ethmoidal cells. The patient, who had been on helmitol, was given ten grain doses every two hours through the day and was operated upon on December 1st, 1910, under cocain. The operation was on the left side, and the middle turbinate and ethmoidal labyrinth were removed, together with what appeared to be the anterior sphenoidal wall. The inferior turbinate was likewise removed. There was a free opening into the frontal sinus. I found no pus in the cells or any evidence of necrosis, but the ethmoidal cells appeared to be distended and filled with some firm substance. The cell which I believed to be the sphenoidal contained a few drops of thick yellowish mucus. He recovered rapidly from the nasal operation, and my notes on December 13th state that the nose was almost well. The helmitol was continued for about eight days after the operation.

Further notes are taken from Dr. Friedenwald's:

"There was a marked improvement in the ocular condition after the operation. In three days the neuritis became distinctly less marked. On December 13th the patient could count fingers at a distance of several feet. On December 20th the vision of the left eye had risen to 20/50, and there was marked improvement in the condition of the papilla. The swelling had almost entirely disappeared and the inflammation was very slight. No elevation could be made out. The margin of the disk was becoming well defined. The patient was discharged December 24th cured and with almost perfect vision in the left eye.

"He returned January 5th, 1911, with complaint that the right eye was beginning to trouble him. At this time the left eye appeared perfectly normal and vision 15/20, but the vision of the right eye, which had been previously normal, was 20/200, and there was now the same picture in this eye which had previously been noted in the left, namely, a marked optic neuritis, but without hemorrhages and not as intense as in the other eye. There were no other cerebral symptoms accompanying the trouble. The patient was again admitted to the hospital, but for purposes of observation only, and was placed upon helmitol so as to reproduce the condition under which he had been placed during his previous stay, but without undergoing the nasal operation. He went through the same course. The inflammation rapidly subsided, and disappeared entirely with complete restitution of vision. He was discharged February 2d, V., R. E., 20/20; V., L. E., 20/30. During his stay at the hospital there were no signs or symptoms of cerebral trouble discovered."

"Note (also by Dr. Friedenwald): The rapid and complete disappearance of the optic neuritis in the left eye following almost immediately after the nasal operation, corroborated the diagnosis first made that the neuritis was due to nasal trouble. The course of the neuritis in the right eye shows that this view was erroneous. It is not impossible that the rapid improvement in both eyes may have been due to the helmitol, which was given in large doses during the whole period of his stay at the hospital."

I can but agree with Dr. Friedenwald's conclusion: That the use of the hexamethylenamin preparation in this case very probably did more for the man than did the operation. The cases of optic neuritis which have been referred to me, with disease of the frontoethmoidal or sphenoidal sinuses, have, with few exceptions, improved or recovered from the eye symptoms after operation, even before the use of hexamethylenamin in sinus disease was known.

Dr. Wolf Freudenthal, New York, reported two cases. The first was a man 35 years of age, who consulted him two and a half years ago at the suggestion of his ophthalmologist. He could not see very well on the right side. Examination revealed empyema of the sphenoidal sinus. Radical treatment to prevent loss of eyesight was recommended. The patient disappeared and did not return for two years. When he came back the sight on the right side had entirely disappeared, and on the left side it was materially weakened.

He had had nothing done in the meantime. One year ago the ophthalmologist examined him and found the left eye perfectly well. The speaker removed the posterior ethmoidal cells and the anterior wall of the sphenoidal, and the patient said he was easy in the head for the first time. The suppuration of the sphenoidal sinuses was not yet cured. X-ray pictures showed the sphenoidal cells, an anterior and a posterior cell. He was afraid to go too deep into the sphenoidal sinus because of the danger of entering the cranial cavity. The sight in the left eye is stationary. There is no toxic infection, but pressure upon the nerve.

Dr. Norton L. Wilson, Elizabeth, referring to the question of the possibility of direct pressure producing optic neuritis, called attention to a case which he reported before the Eastern Section five years ago. The frontal and ethmoidal sinuses were involved, and when he performed the Killian operation he found that the abscess had broken through the wall into the orbital cavity, causing pressure upon the optic nerve.

Dr. Frank Allport, Chicago, desired to say that one of the previous speakers seemed to feel that ophthalmologists are not at all accurate in their diagnosis of toxic amblyopia. He desired to say that scarcely any eye disease is so easily diagnosed as that resulting from alcohol or tobacco poisoning. The symptoms, which it is not necessary to give here, are so characteristic that they can scarcely be misunderstood. The connection between ophthalmology and rhinology is extremely close, and is of even greater importance to the ophthalmologist than it is to the rhinologist. There can be no question but that a great many eye diseases originate in diseases of the nose or accessory sinuses. Dr. Allport said that this fact was so well established that it had become a routine practice in his office to have all eye diseases of doubtful origin examined by an expert rhinologist in his office, as to the condition of the nose and accessory sinuses. He does not believe that ophthalmology can be really successfully practiced without a knowledge of the intimate association existing between eye diseases and nose diseases. The ophthalmologist who does not take into consideration this important fact must invariably miss one of the most important diagnostic and curative features of his profession.

Dr. Smith, in closing the discussion, said there might be circulatory disturbances without a purulent condition adjacent, but there could not be a purulent condition present without circulatory disturbances. Referring to Dr. Beck's remarks concerning antisyphilitic treatment, he said all the cases cited had had that treatment. They had had strychnia also. Of course one was inclined to be skeptical about the antisyphilitic treatment unless given individually, but in his cases the condition was progressive and he could not wait long enough to put the patients on antisyphilitic treatment. He had one patient who could see on the day before the operation and who could not see at all on the day of the operation, thus demonstrating the rapidly progressing disturbance. With this progressive condition, where all other possible causes have been eliminated, one should not hesitate to go in and relieve the pressure, no matter to what the pressure was due.

IX. Preservation of the Anterior Wall in the Radical External Frontal Sinus Operation.

Dr. Thomas J. Gallagher, Denver. The older operations consisted in the removal of more or less of the anterior wall, with or without enlargement of the frontonasal canal. In some instances the sinus is packed and allowed to heal by granulation. Instead of removing the anterior wall, an osteoplastic flap has been used by some operators, deformity being thus obviated. All these methods are open to the objection that the ethmoidal cells are practically ignored, reinfection being apt to occur and more or less deformity to result. The Killian operation has proved effectual, the only objection being the resulting deformity. In the author's opinion the lower portion of the Killian operation should be performed first, preserving the anterior wall, unless it is found impossible to satisfactorily remove the debris from the sinus from below. He had performed six external operations in which the anterior wall was preserved, the procedure below the arch being a typical Killian. The size and contour of the sinus should be ascertained by X-ray photographs.

DISCUSSION.

Dr. H. Holbrook Curtis, New York, said he was the first member to have read a paper on the frontal sinus operation before the society. He had shown three cases in the 1902 meeting at Washington, in which he had operated through the anterior wall and treated the wound, after curetting and making a wide opening into the nose, exactly like a mastoid operation. The cavity was repeatedly packed until obliterated. Coakley later reported 104 cases done by this method.

Though it was the opinion of the speaker that the operation through the anterior wall was the safer operation, the deformity which resulted led him to seek other methods.

Killian about this time proposed his method of saving the ridge, which in many instances was an ideal operation. Latterly, however, Killian was preserving much more of the anterior wall than at first. Today the external operations are being done entirely too often.

It is very easy to break down all the ethmoid cells and by means of the instruments employed by Ingals, Myles, himself and others, to remove the structures rendered fragile by the inflammatory process and efficiently drain the sinuses. The removal of the middle turbinate, all the ethmoid cells and entrance to the sphenoid is easily done in fifteen minutes after cocain anesthesia.

Until recent times it was thought necessary to remove the inferior wall of the frontal to do this. The future would show much fewer external sinus operations; there would be hardly any if the specialist got the cases in time.

Dr. Ross Hall Skillern, Philadelphia, said the preservation of the anterior wall, as Dr. Gallagher himself states, is not a new one, and it would be merely a useless repetition and waste of time to attempt to apply it to all cases of frontal sinusitis requiring an external operation.

It is the general consensus of opinion that it is inapplicable in the majority of cases, on account of the numerous fistulæ which follow.

Von Eichen, while Killian's assistant, in summing up the results of the Freiburg clinic for eight years, laid particular stress upon this point, and has seen many cases of fistula formation after leaving the anterior wall intact; sometimes several years after the operation, which requires subsequent surgical intervention. In certain well selected cases this form of operation may be indicated. I mean those in which the sinus does not extend high in the frontal bone and is of regular contour. In other words, one in which we can reasonably expect complete obliteration by the ascension of the orbital fat. If recesses and hollows remain which have not been thoroughly reached, failure more or less complete will certainly result.

Ritter (*Deutsch. med. Woch.*, 1906) endorsed this infraorbital method of sparing the anterior wall, but has since abandoned the procedure after having reported two deaths following its application.

Dr. D. J. Gibb Wishart, Toronto, said he was in Vienna when Killian reviewed his cases, some of them having been operated upon two years before they were reported. He had had the pleasure of seeing these cases, and was impressed by the absence of deformity.

Dr. Walter A. Wells, Washington, cited a case which illustrated the natural tendency of frontal sinus disease to recover. The case presented all the symptoms which urgently indicate radical operation, and he performed the Killian operation, when he found a complete breaking down of the septum. He did not think it wise to do a double operation, but anticipated having to do the other side later. Not only did the side operated upon clear up completely, but the other side also, and there has been no return of the symptoms during the two years which have elapsed since the operation.

Dr. Gallagher, in closing the discussion, said that he never resorted to the external operation until after the intranasal operations had failed. He believed the lower Killian operation would succeed in most instances, thereby saving the anterior wall and preventing deformity.

X. Accessory Sinus Suppuration in Scarlatina.

Dr. Thomas Hubbard, Toledo. Nearly all cases of scarlatina having socalled "purulent rhinitis" have sinus suppuration in varying degree of severity. Some die from this cause, many recover spontaneously; and between these two extreme groups there is a class which presents distinct indications for surgical treatment. The very severe type usually die from meningitis or septic thrombosis of the venous sinuses with metastases; and chronic suppuration with complications, necrosis and fistula formation is the fate of those having sinus suppuration of moderate degree of severity, unless aided by timely surgery.

All of the exanthematous diseases should likewise be regarded as initial causative factors of acute and chronic nasal and sinus suppuration; and these cases should be treated by the rhinologist during the acute stage, with the purpose not only to prevent ear infection, but also to prevent sinus empyema, which terminates at best in chronic suppuration. As a general rule, the same surgical axioms apply in accessory sinus suppuration with symptoms of septic thrombosis as are applicable to mastoiditis.

The author reported a case of scarlatina complicated by purulent mastoiditis, the suppurative sinusitis involving the frontal, ethmoidal and maxillary sinuses. Recovery followed operations. Autogenous vaccine treatment was begun on the fifth day after the sinus operation, because of increasing fever, pus, etc. This treatment seemed to establish a decided change for the better, and it was continued into convalescence.

DISCUSSION.

Dr. Henry O. Reik, Baltimore, said he had had the privilege of serving as consulting otologist to the Infectious Diseases Hospital, managed by the Board of Health of Baltimore, and had been impressed here and elsewhere by two features of scarlet fever cases. The first is the ignorance of general practitioners concerning the relationship between infectious diseases and the accessory nasal sinuses. The second is the ignorance of rhinologists on the same subject. The ignorance of the general practitioner is more excusable than that of the rhinologist. The otologist has been hammering away at the subject so long that the men in charge of these hospitals have come to be pretty "keen" in regard to the association of scarlet fever and middle ear disease. They are awake to the possibilities of involvement of the tympanum and mastoid, and do not wait long before either acting themselves or consulting a specialist.

With regard to the nose it is different. The attending physician has not been impressed with the importance of nasal infection in scarlet fever, and has been allowed to believe that if infection occurs it is partly his fault, hence he is less likely to report it. Infection of the nose is not necessarily the fault of the physician, any more than is infection of the ear, but the text books often lead general practitioners to think so.

It is important to bear in mind how frequently chronic rhinitis of a purulent character or involvement of the sinuses may be traced to scarlatinal infection. In most infectious diseases hospitals scarlatinal cases are not allowed to leave until the purulent otologic condition has been cured. This does not apply, however, to the rhinologic region, patients often being allowed to go out while still subject to a purulent discharge from the nose.

(To be Concluded in the December Number.)

ABSTRACTS FROM CURRENT LITERATURE.

I.—EAR.

Observations on the Upper Tone Limit Both for Air and Bone Conduction.

STRUYCKEN (*Beiträge zur Anatomie, etc., des Ohres, der Nase und des Halses,* Bd. 5, Heft 1, pp. 1), the inventor of the metal monochord bearing his name, reviews his recent work on the use of the monochord in determining the upper tone limit, not only for air but also for bone conduction. The upper limit for bone conduction varies between 17,000 and 26,000 vibrations, and for air conduction between 15,000 and 22,000 vibrations. From this article and many others which have been reviewed during the past two years on this subject, the original claim of Hegener that the monochord would entirely substitute the Galton whistle seems to be coming true.

Horn.

The Treatment of Otosclerosis.

BRYANT, New York (*Beiträge zur Anatomie, etc., des Ohres, der Nase und des Halses,* Bd. 5, Heft 1, pp. 15), shows by his article in the most conservative of German journals that American otologists have some message to convey to our German confreres on this very much mooted question. The article is a timely one, for without question some of the most important advances in otology in the next few years will be made along the line of prophylaxis in catarrhal deafness and otosclerosis. The American school is far in advance of the European, and the consideration which has been given to the recent work of Yankauer, Hays, Holmes, Bryant and others is good evidence of this fact.

Bryant claims that a careful treatment of the nasopharynx, the details of which he gives, and which have undoubtedly appeared somewhere in English, will cause a complete cessation of the otosclerotic process in 90 per cent of the cases. The outlook for an improvement in the hearing is unfavorable in those cases where the patient is almost deaf. In the worst cases he has obtained an improvement for the watch from

0 to 5/150 or even 8/150 centimeters. In more favorable cases, where the deafness is of short standing, the hearing can reach normal again. *Horn.*

Neuritis Acustica Alcoholica.

Morian (*Beiträge zur Anatomie, etc., des Ohres, der Nase und des Halses,* Band 4, Heft 3, pp. 257) states that there are surprisingly few accurate observations in the literature on this very important subject. The author has been able to collect but eight cases, to which he has added three. All of these observations have been made on clinical data, and with the exception of his own cases the details have been meager. The cases have all been in men, the ages ranging between 20 and 50 years. Generally the patients were addicted to chronic alcoholism. The disease began suddenly; the deafness developed in from a few hours to a few days. In some of the cases there was no previous history of deafness, so that one has a right to assume an acute neuritis. In other cases there was more or less involvement of the acoustic, some due to the patients' calling, boiler makers, etc., so that these cases can be considered as an acute exacerbation. The affection was always bilateral, and the loss of hearing ranged from complete deafness to the hearing of spoken words in contact with the ear. In the worst cases the bone conduction was completely absent, in others very much shortened. Rinné was always positive. The lower limit for sound was somewhat raised, but the upper limit was invariably lowered. The clinical picture was always that of atypical cases of deafness due to the involvement of the cochlear branch. The vestibular branch was also somewhat involved, as was shown by the presence of subjective noises and dizziness. The diagnosis in all of these cases was strengthened by the accompanying symptoms, such as involvement of the optic nerve, amaurosis, central scotoma, paralysis of the oculomotorius and the facial, ataxia of the extremities, etc.

The treatment, total abstinence, etc., gave the following results: 3 cases, a complete recovery of hearing; 3 cases remained the same; 3 cases gradually got worse.

Horn.

Fibrolysin in Otology.

Yearsley (*Journal of Laryngology,* May, 1911). Prompted by the various reports of its use in otology, Yearsley has employed thiosinamin, in its improved form known as fibrolysin, in a series of twenty cases of otitis media. Of the twenty cases, seven were males and thirteen females. Three only, or fifteen per cent, were improved. In sixteen there was no improvement, while in one the improvement was doubtful. Two of the cases were instances of postsuppurative adhesion, six were of otosclerosis mixed with catarrh, while the remainder were late stages of chronic middle ear catarrh. In every case other treatment had been made before fibrolysin was used. The drug was used in the form of injections in the arm. The author regards his results as very disappointing, and he has abandoned further trial. From his own experiences, he cannot agree that fibrolysin merits the eulogies that some observers have lavished upon it. *Harris.*

Treatment of Otitis Media Purulenta and Mastoiditis in Infants.

Page (*New York Medical Journal,* February 11, 1911). In the author's service at the Babies' Hospital, hydrogen peroxid in middle ear diseases has been used with gratifying results. No other remedy has yet been found as efficacious. In eighty-seven cases of acute purulent otitis media, complicating other diseases, only three were operated upon for mastoiditis. Through the winter the ears are examined in every case, and the red and bulging membranes are incised and treated with instillations of hydrogen peroxid and boric acid irrigations from the beginning.

The records of the Manhattan Eye, Ear, Throat and Nose Hospital show the mastoid operation is attended with only slight danger to life when performed on babies in an average state of health. For the year ending October, 1909, there were sixty-eight mastoidectomies, simple and complicated, performed on children under three years of age, with only two deaths following. Early diagnosis to enable early treatment is the all-important thing. In contagious diseases, daily examinations are necessary. A high mortality after operations on the mastoid is more often due to neglect to the ear condition before operation than it is to the operation itself. *Harris.*

New Experiments in the Local Anesthesia of the Drum Membrane.

ALBRECHT (*Archiv fuer Ohrenheilkunde,* Vol. 85, No. 3, p. 198). In view of the unsatisfactory results obtained by the present methods of cocainizing the drum membrane for slight operative procedure, Albrecht has conducted a series of elaborate experiments with iontophoresis. Iontophoresis means the carrying into the cells of the body through the intact epithelium of the skin of various materials by the aid of the galvanic current. As the name indicates, the nature of the process lies in the wandering of the iones.

As is already known, in the solution in water of a compound body, as for example salt, not merely are there physical but also chemical processes at work. In addition to the molecules so well known, there is another kind of molecule present, the electrones. These are chemical elements of very little weight, whose electrical force is constant for chemically equivalent masses. The new combination of the electrones with the molecules of the solution is called iones, and is divided according to their positive or negative qualities into kateones and aneones. The formation of the iones means the disassociation of electrolysis in the solution. It is an important observation that the disassociation is in proportion to the concentration of the solution; correspondingly less as the solution is stronger.

Based upon these chemico-physical facts, the author has clinically considered two questions: first, how long an anesthesia produced by this method will last, and what is the best strength of solution to use. He has devised a special handle for applying the current to the drum, and has used the method in twenty cases of chronic middle ear suppuration and in thirty-two of acute suppuration, besides in several cases of furunculosis of the canal. His conclusions are as follows: By the help of iontophoresis we are able to introduce cocain and adrenalin into the drum membrane through the epidermis. The cotton saturated with the cocain-adrenalin solution is connected with the positive pole by means of a specially devised instrument. The instrument is placed under some pressure upon the drum and fixed there. The best solution to use is a 20 per cent cocain solution mixed with a relatively large amount of suprarenim. The strength of the current varies from 1.5 to 2.0 m. a. In the use of the method for chronic inflammation of the drum membrane, certain difficulties are encountered, such as vertigo and pain, which are not met with in acute otitis. The chronically diseased drum membrane requires a longer time for anesthesia than that acutely inflamed,—three to four minutes. The anesthesia limits itself to the exact spot where the instrument has been placed. It is, as a rule, so complete that the paracentesis can be carried out entirely without pain. For furunculosis of the canal, the method on account of inability to produce complete anesthesia is not so well indicated. *Harris.*

II.—NOSE.

Prolonged Epistaxis Associated with Increased Vascular Tension.

Hays (*New York Medical Journal,* March 4, 1911). Hays reports a case of epistaxis occurring spontaneously in a man of forty-five, of good general health, weighing 230 pounds. The hemorrhage was excessive and implacable. It yielded only temporarily to nasal packing and was finally controlled by large doses of morphine and nitroglycerin, administered for the purpose of lowering the blood pressure which, at the onset, registered over 200. Under this treatment the patient finally recovered.

The author calls attention to the difference in the treatment of bleeding associated with increased vascular tension, and that due to local causes entirely. The patholigic change in the ruptured artery at the point of rupture is the cause for the excessive hemorrhage and the prolongation of the symptoms. Indirect pressure by blind packing is the least of the remedies to be applied in such cases. This form of hemorrhage is to be distinguished by its sudden onset, its profuseness, its long duration, its frequent recurrence, the difficulty of control (the usual styptics having no effect), the large amount of blood lost without affecting the patient, and its response to remedies which reduce the arterial tension. *Harris.*

A Note on Turbinal and Sinus Function.

Adams (*Journal of Laryngology,* June, 1911). As a result of his studies of the physiology of the nose and accessory sinuses, Adams draws the following conclusions:

(1) The whole mucous membrane of the respiratory tract from the nostrils to the bronchioles is hygrothermic and the chief agent to this end.

(2) The whole nasal mucous membrane is specially concerned in this function.

(3) The sinuses are accessory not only anatomically but also physiologically, more especially during the forced respiration of exertion.

(4) The turbinals, while important accessories to the hygrothermic function, especially during respiration, are probably quite as much directional and regulatory in their action, i. e., they help to regulate the amount and direction of the air current going to and drawn from the sinuses, and respond to the amount required for the lungs.

His investigations agree with those of Pahlsen in regard to the course which the inspired air pursues in passing through the nose, namely, the fore end of the lower turbinal and then between the middle turbinal and the septum and along the roof and down in front of the sphenoid. This applies to quiet breathing. For forced inspiration the air takes the route of the middle meatus also, to the outside of the middle turbinal. Differing from Pahlsen, however, he finds that the expired air goes above and below the inferior turbinal. The capacity of the sinuses is twice that of the nasal cavities proper, so that they are capable of storing a fair volume of warm air. When we consider the capacity of the sinuses, their character, their position, their relation to the air-paths, and the shrinking of the turbinals on exercise, it is difficult to avoid the conclusion that the sinuses are chambers for storing the warm, moist air, to be mingled instantly with the inspiratory air, especially on exercise. If the present contention be correct, the ablation of the sinuses cannot be regarded as a triumph of surgery. We should expect a pharyngitis to arise, and for the same reason after the ablation of the inferior turbinal.

Also, the effect of exercise on the turbinals points to one important element in the treatment of what is called "vasomotor rhinitis." *Harris.*

The Treatment of Empyema of the Antrum of Highmore, by Means of a Temporary Resection of the Inferior Turbinate.

Hirsch, Vienna (*Monatschrift für Ohrenheilkunde,* June, 1911), the originator of the method of temporary resection of the anterior end of the inferior turbinate, reviews all the conservative operations now advocated for the cure of empyema of the antrum, and concludes that any operation that causes a permanent destruction of any part of the turbinate is to be avoided. The attending atrophic rhinitis, which he claims always follows, is worse than the original disease. His present method is as follows: A vertical incision 1 cm. long is made just in front of the anterior end of the inferior turbinate. A second incision, at right angles to this, is made along the root of the turbinate. The mucous membrane is now dissected away until the free surface of the bony turbinate is seen. The triangular flap is pushed back and the end of the turbinate is freed from its bed with a strong pair of scissors. The remaining mucous membrane on the side wall of the nose is freed and reflected downward. An opening is made into the antrum as large as is necessary. The flap from the side wall is laid into the opening, and the end of the turbinate is sewed back into place by means of the triangular flap. Sixty-two cases have been operated in this way since 1907 with the very best results. *Horn.*

Chondroma of the Nose.

SCHWERDTFERGER (*Zeitschrift für Laryngologie,* Band 3, Heft 6, 1911) reports this exeecdingly rare condition and gives details of the operation, which included a Killian operation, a Denker antrum operation and the opening of the sphenoid, before the growth could be removed in toto. The tumor mass, a pure chrondroma, measured 6x5x3 cm. and displaced 35 cc. of water. There have been but eight cases recorded as occurring in the nose and accessory cavities. A complete bibliography and histologic report accompanies the article. *Horn.*

Recurrences After the Adenoid Operation.

IMHOFER (*Zeitschrift für Laryngologie,* Bd. 3, Heft 6, pp. 713) makes a careful study of this most important question, which has been neglected by practically every text book, and which is scarcely ever mentioned in the literature. He divides the cases into two groups: 1. Real recurrences, i. e., the actual growth of new adenoid tissue after the operation, or the enlargement of small pieces resulting from an incomplete operation, which give rise to symptoms of adenoid hypertrophy. 2. Pseudorecurrences, where it is not possible to demonstrate new tissue, but where the symptoms of an apparent adenoid hypertrophy are still present.

He considers that 3 per cent, the usual proportion of recurrences generally given, as far too small. The causes of recurrences fall under three heads: 1. Recurrences which can be laid at the door of the operator. 2. Recurrences caused by the condition of the adenoid itself. 3. Recurrences caused by the general bodily condition.

This last cause he considers by long odds the most important. As a result of his present investigations he is convinced that the recurrences are not due to fragments of adenoid tissue left behind, but, above all, to the fact that there is present a scrofulous diathesis. In cases of scrofulosis the adenoid operation is of the greatest value in the ultimate cure, but the disease must be energetically treated after the operation. *Horn.*

III.—LARYNX.

Cycloforn, a New Analgesic.

Rosenberg (*Revue Hebdomadaire de Laryngologie,* April 8, 1911). Cycloforn is a synthetic product put out by Frederick Bayer & Company. Its chemical composition is l'ether isobutylique de l'acide para-aminobenzoique. It is a white powder, soluble with difficulty in water. This characteristic renders its local use more satisfactory, inasmuch as the tendency to absorption is less. Rosenberg has never seen a case of intoxication following its use. Baumgarten has gotten excellent results from a mixture of cycloforn and corifin in tubercular laryngitis. Rosenberg has employed the drug only in its pure state, and the result has been excellent. When it is desired to apply it to a definite spot in the larynx, injection is the best method. Usually, however, insufflations are to be used. Used in this way, no unpleasant results have been noticed. The analgesic effect usually manifests itself in from five to ten minutes, and seems to increase, at least temporarily, with subsequent insufflations. Some patients have stated that the third application would allow them to swallow for three days without pain.

In addition to employing it in laryngeal tuberculosis, Rosenberg has made use of it in lacunar tonsillitis with favorable effect upon the dysphagia. *Harris.*

Ulceromembranous Laryngitis.

MOURE (*Revue Hebdomadaire,* March 11, 1911). Up to recently it was supposed that the affection known as Vincent's angina and dependent upon a fusiform bacillus and spirillum, was limited to the tonsils and pharynx. In 1907, however, Reiche reported a case involving the larynx associated with difficulty in swallowing and paralysis of the right vocal cord. A third case is that of Arrowsmith, reported before the American Laryngological, Rhinological and Otological Society in May, 1910, and the second case is that of Moure, reported at the Budapesth Congress of 1909.

The patient was a man of twenty-two, who had a history of repeated acute affections of the throat including a gangrenous edematous angina of the nasopharynx three years previously, from which he had made a complete recovery. The present attack began in March, 1910, following an angina of scarlatinous nature. Ulcerations were first noticed on the tonsils with repeated bleedings. The bacteriologic examination showed fusiform bacilli and spirilla. When first seen by Moure, the general condition was bad; elevation of temperature, foul breath. Examination of the throat showed a grayish exudate, diphtheritic in appearance, covering the tonsils, the tonsillar pillars and the base of the tongue, resting on an ulcerated area, which bled at the slightest touch. The laryngoscopic examination showed epiglottis red and swollen. The patient complained of severe pain in the lower portion of the throat and difficulty in swallowing. After a temporary improvement the mucous membrane of the larynx began to ulcerate, and was covered with a grayish exudate similar to that on the tonsils. The swelling involved the ventricular bands and the crico-arytenoidal articulations became immobilized. Respiration was difficult; swallowing very painful, so that the patient had to be fed through a tube. The 30th of March, a tracheotomy was performed with immediate relief. During the next few months the condition remained about the same. It was not possible to breathe without the canula; large quantities of spirilla and fusiform bacilli continued to be found in the secretion.

In September he was brought to Moure's private clinic. The general condition was far from satisfactory. Frequent changes of the canula and cauterizing of the granulations were necessary. The condition of the larynx remained the same. There was no change in the voice. The use of Schroetter's tubes was unsuccessfully attempted. In May, 1910, dilatation of the larynx was commenced by means of sounds carried into the trachea outside of the canula. In spite of a setback, the general condition of the patient improved during the summer, and in the fall of 1910 the dilating tubes had been increased from No. 21 to No. 48.

The case was still under observation at the time of the report.

This morbid manifestation finds its origin either in the larynx itself or in the region in front of the larynx, attacking by continuity the laryngeal cavity, the trachea and even the bronchi.

The symptoms are the same as those when involving the throat. It is noticeable, however, that no fragments of necrosed cartilage are found in the discharge, pointing to the superficial character of the lesion. The local troubles are generally accompanied by symptoms of intense prostration; fever, emaciation, etc. The inflammation shows itself not merely in the infiltration of the arytenoepiglottic folds, but also in the immobilization, more or less complete, of the vocal cords in the medial position, as a result of cricoarytenoid arthritis. A cicatricial form which the disease may assume, leads to an adhesion of the ventricular bands, or the vocal cords between themselves, or a formation of fibrous tissus, such as is seen in other ulcerative conditions of the larynx. Prognosis is very grave.

Treatment.—Moure recommends the washing of the throat with a solution of borate of soda, and the touching of the ulcerated areas with borated glycerin. Internally, chlorate of potash is to be administered in large doses. *Harris.*

IV.—MISCELLANEOUS.

Endobronchial Treatment of Asthma.

FREUDENTHAL (*New York Medical Journal,* June 24, 1911). After reviewing the work done by Ephrain, Horn and others in this field of work, Freudenthal reports four cases, and mentions seven others, of bronchial asthma which have been treated by him with the bronchoscope. Of the eleven cases, eight can be considered cured, three were greatly improved, and two showed no benefit whatever. These data would would appear in his opinion to compare favorably with the results obtained by other methods. The view of the interior of the trachea as well as the bronchi in these affections, was of much interest. In one case there was, apparently, a constriction of the trachea, the whole lumen was swollen and closed, and could not be dilated by cocain. This was no doubt one of those cases of spasm of the trachea due to an irritation of the respiratory center. In all cases the bronchoscope was used under local anesthesia, the patient preferably sitting in an upright position. Some pain followed, lasting in some cases three or four days, in others only a few hours. The duration of the treatment in his cases was longer than those treated by Ephrain.

The author is convinced, as a result of his work, that there are asthmogenous points in the bronchi as well as in the upper respiratory tract. By attacking these points directly by topical endobronchial applications, the foundation has been laid for a new means of combating and conquering this dread disease.

Harris.

A Case of Acute Suppurative Thyroiditis Following the Grippe.

Bahri (*Revue Hebdomadaire de Laryngologie,* February 5, 1911). The statistics of Galli show that out of forty-four cases of thyroiditis, only two were due to grippe. Bahri's case was a man of forty-two who had always enjoyed good health. Fifteen days previous to first being seen by Bahri, he had been seized by a severe head-cold, with elevation of temperature, cough and general prostration. As the symptoms of this began to mend, he noticed that his neck in the region of the larynx was swollen. This kept increasing until finally there was difficulty in swallowing and breathing. Examination showed a smooth, hard swelling in the region of the larynx, extending to the sternum. Laryngeal crepitation was totally abolished. The larynx mirror showed the two right aryteno-epiglottic folds swollen, as a result of the edema, which extended to the ventricular bands. The patient could not turn his head on account of the pain. Breathing and swallowing were difficult. This condition persisted for a week in spite of local applications. At the end of that time the swelling began to soften, and the patient felt slightly better. An incision was made in the median line and the abscess completely drained. The day following, the interior of the larynx commenced to take on its normal appearance. The dysphagia and difficulty in breathing disappeared. Examination of the pus showed streptococci. The patient made an uneventful recovery. *Harris.*

A Sou in the Esophagus, Removed by the Modified Kirmissom Hook.

Botey (*Revue Hebdomadaire de Laryngologie,* June 17, 1911). The patient was a boy of six, who had swallowed a five centime piece. The radiograph showed its position behind the sternum. The use of chloroform was inconvenient. Botey accordingly decided to make use of the Kirmissom hook, which was introduced without difficulty after cocainization of the pharynx and mouth of the esophagus. The coin was removed on the second attempt by carrying the index finger behind the blade of the instrument along the base of the tongue to prevent the engagement of the coin against the lower border of the cricoid. The author does not regard this procedure in any way a retrogression from esophagoscopy which always demands general anesthesia and previous training. He has modified the instrument by making its diameter smaller and its end more acute, in order to permit of its introduction between the coin and the posterior wall of the esophagus. The instrument is further provided with a scale in centimeters, to assist in exact location. He has also devised a contra-hook for the purpose of preventing the coin from catching against the posterior portion of the cricoid.

He regards the use of the instrument entirely safe, and recommends it in advance of the esophagoscope because of its ease of introduction and its freedom from danger. In case of failure the esophagoscope can then be used.

This is the third case of its kind where he has succeeded in removing the foreign body by means of the Kirmissom hook. *Harris.*

A Maltese Cross Fixed in the Esophagus. Failure of the Esophagoscope; Extraction with the Kirmissom Hook.

Fournier (*Revue Hebdomadaire,* March 25, 1911). A child of six swallowed, while at play, a maltese cross. The following day she swallowed without difficulty. A radiograph taken a week later showed the cross in the esophagus behind the larynx, in the region known as the hypopharynx. After several attempts an eight millimeter esophagoscope was introduced but it was impossible to discover the foreign body. Lying as it did in the hypopharynx and wedged behind the cricoid, it was easily hidden between the external surface of the tube and the surface of the esophagoscope, in a region normally obscure and rendered more so by the inflammation following the presence of the foreign body for eight days. The esophagoscope was accordingly abandoned and the Kirmissom hook was used, which seized the foreign body at the first attempt. In order to avoid injury to the larynx, removal was effected by means of the index finger of the left hand being introduced back of the arytenoids, so as to throw the larynx forward. The author does not feel that esophagoscopy is a method to be rejected but that it is not a panacea for all conditions of the esophagus. The case shows further that it is not always possible by direct examination to see a foreign body. The author concludes with a caution in regard to care against perforation in the removal of foreign bodies of irregular contour. In his opinion the Kirmissom hook is particularly indicated in such a case as this. No general anesthesia is required, its technic is simple, and the result certain. *Harris.*

BOOK REVIEW.

Diseases of the Ear, Nose and Throat—Medical and Surgical.

By Wendell Christopher Phillips, M. D., Professor of Otology, New York Post-Graduate Medical School and Hospital. Illustrated with 545 half-tone, and other text engravings, many of them original, including 31 full page plates, some in colors. Price, $6.00. Published by F. A. Davis Co., Philadelphia, Pa.

Dr. Phillips' book is divided into three sections, the first devoted to the ear, the second to the influence of general diseases upon the ear, nose and throat, and the third to the nose, accessory sinuses, pharynx, fauces and larynx. Three hundred ninety-nine pages are given to the ear, nearly 80 pages to the influence of general diseases, and the balance of the book, some 330 pages, to the nose, accessory sinuses, pharynx, fauces and larynx.

This book, which represents the results and experience of many years of teaching, is written in an easy conversational style, as one would talk to a class.

In the section on general considerations, the general therapy of ear disease is discussed with sufficient detail to be a real help, while the drawings which illustrate the incision of the drum membrane are especially to be commended. They really illustrate, and the student ought to be able to do the operation from the description as given.

Blood examinations in acute aural affections are considered to be of value, but not fully determinative. Key plates are furnished for the principal half-tone illustrations, thereby making them doubly valuable, while an occasional clinical case illustrates, and serves to emphasize the points in the preceding description. Every phase of diseases of the ear is discussed, and with due consideration to their relative importance.

A most excellent chapter is devoted to the important subject of external deformities of the ear. The reviewer has not seen as good a one in any text book, or even in any work devoted to cosmetic surgery.

With reference to the indications for the simple mastoid operation, the author is conservative in his view, and says: "It is not wise to operate immediately upon every patient who has tenderness on pressure over the mastoid antrum during the first three or four days of the attack, for the reason that in the milder cases it is quite possible for drainage through the aditus, combined with local absorption, to effect a cure without operation; and, further, it is deemed safer in the interest of the patient to operate after nature has thrown out some protective limitations to the disease within the mastoid cells." So much mastoid surgery has been done in the past few years, some of which perhaps unnecessarily, that a word of caution is not without value. So far as the operation itself is concerned, clear, concise, rational directions, with a detailed explanation of each step, is given. Dr. Phillips very properly objects to the use of the chisel a bit more than absolutely necessary, on account of the danger of shock to the brain, a danger which is likely to be unrecognized when the patient is under an anesthetic, preferring the rongeur. The single incision is advocated, and the right-angled posterior cut, as recommended by Whiting, is not considered necessary. The subject of the plastic, after the radical mastoid, is discussed at length, and illustrations given of all the principal flaps in common use. He believes that the average results obtained from carefully constructed plastic meatal flaps, when anchored in the most favorable location within the wound cavity, are fully equal to those obtained by the employment of skin grafts, and although brilliant results occasionally follow the successful use of skin grafts, he regards the proportion of such cases as inconsiderable.

The complicating lesions of purulent otitis media are well presented, and the complex subject of the labyrinth made as clear as it is possible to do.

With reference to thrombosis, Dr. Phillips takes the conservative view, that even if the surgeon is convinced that a clot is present, it is inadvisable to interfere surgically with the sinuses, provided no symptoms of infected thrombosis have appeared, and he is firmly convinced that noninfected thrombi may develop in the lumen of a venous sinus, which eventually becomes organized into connective tissue, and that to operate upon cases of such type is a questionable procedure. The conservative treatment of chronic purulent otitis is given with considerable detail, and the indications for operating are rather clearly stated. The author is a moderate conservative in discussing the cases of chronic otitis that need a radical operation, and he considers the prognosis for conservative treatment to be good from the clinical standpoint, when the case is not of long standing, uncomplicated by granulations, the otorrhea is not fetid, and is mucopurulent in character. He opposes the socalled conservative radical operation, considering all such operations as incomplete, since the annular ring and outer wall of the attic and the ossicles, three of the chief centers of necrosis in chronic purulent otitis, are necessarily left untouched.

The reviewer would question the statement on page 179, with reference to the action of the stapedius muscle. "This muscle receives its nerve supply from a branch of the facial, and it acts upon the head of the stapes by causing the bone to make pressure upon the contents of the vestibule." On the contrary, the action of the stapedius muscle seems to be to cause about one-third of the stapes to press inward on the vestibular contents, while the other two-thirds, at the same time, are drawn outward, and contraction of this muscle will lessen the tension on the labyrinth, and not increase it.

Taken as a whole, the reviewer regards the section on diseases of the ear as one of the best ever written, and representative of the latest practice in every particular. It is one of the first, if not the first, text-books on the ear, nose and throat to have an account of salvarsan and its results in syphilis. Contrary to most text-books, diphtheria is included, as is also the subject of intubation, a detailed description of the technic of which, illustrated by half tone drawings, is given. No theory is advanced as to the etiology of atrophic rhinitis, the author considering that there are many causative factors, and that these vary in the individual case.

The chapters devoted to tuberculosis and lupus are very full, and worthy of careful study. In the section on sinus disease an excellent series of skiagraphs is given. Careful study of these should enable the reader to interpret skiagraphs, since the skiagraphs are practically useless, unless one is capable of properly interpreting them. Hence, the series of skiagraphs are a very important factor of the book.

In operating on adenoids, preference is given Beckman's curette, but the Brandegee forceps is recommended in case one operates with the forceps. The reviewer does not regard this forceps as a proper instrument for the removal of adenoids, and would justify this opinion by Dr. Phillips' own statement. "The closing of the jaws of the forceps does not fully cut through the mass, and one or two rocking movements should be made, with sufficient force to partly cut and partly tear off the adenoids, before it is drawn downward into the mouth; otherwise there is danger of stripping the membrane from the posterior pharyngeal wall. As a rule, it is necessary to complete the removal with the curette or finger, preferably the former." So excellent an instrument as the Laforce adenotome, which removes the adenoid entire, without any tearing or injury to adjacent parts, is not even mentioned.

The subject of tonsil hemorrhage is rather slighted, only fourteen lines being given to it, though there are three pictures of tonsil hemostats; nor is any mention made of lactate of calcium as a preventive of hemorrhage. The technic of bronchoscopy and esophagoscopy are briefly described.

The criticisms herein given are purely minor. The book represents an enormous amount of careful labor, and, as a whole, has the entire praise of the reviewer. Practically every disease with which the practitioner of the nose, ear and throat is liable to come in contact is mentioned, while the chapters on general diseases of the ear, nose and throat will be found very profitable for the general practitioner as well as the specialist, both meeting here on common ground. Each division of the book is practically complete. This has necessitated more or less repetition, such, for instance, as hypertrophic rhinitis, which is discussed on pages 484 and 485, and again on pages 646 to 649. For purposes of reference, however, this makes each section a complete monograph.

Ample credit has been given throughout the book to the work of others in the same field, and many illustrations taken from other sources, due credit being always given. The reviewer compliments Dr. Phillips on the general excellence of his work, and bespeaks for the book a large sale. It is one that will be especially helpful to the beginner in the specialty, since the directions are sufficiently clear as to be readily followed. The specialist of experience will find much of interest and profit in the volume, while the general practitioner will find the entire subject of the diseases of the ear, nose and throat properly correllated in their relation to general medicine. This latter feature is especially to be commended, since there has been more or less tendency of late to treat too many of the affections of these organs wholly from a surgical standpoint. Dr. Phillips has viewed the whole subject with the proper perspective, and his general directions as to when the aid of surgery is to be invoked, and when it is not, can be safely followed. The book adds one more to the long list of works that reflect credit on American laryngology.

Richards.

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LVIII.

THE SPREAD OF BACTERIAL INFECTIONS FROM THE NASAL AND NASOPHARYNGEAL CAVITIES BY WAY OF LYMPHATIC CHANNELS.*

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Bacteriology of the Healthy Nasal and Postnasal Cavities.—It will not be out of place to make a brief reference to the bacterial flora of the normal nasal, nasopharyngeal, and accessory nasal cavities, and to draw attention to the bacteriology of the common catarrhal conditions of the upper respiratory passages. In spite of certain conflicting opinions regarding the relative prevalence and virulence of microorganisms in the healthy nasal passages, the investigations of Park and Wright, St. Clair Thomson and Hewlett, Hasslauer, Viollet, Paulsen, Strauss, von Besser, Lewis and Logan Turner and others have clearly demonstrated their existence under normal conditions.

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*This paper was read at the opening of a discussion at the Third International Laryngo-Rhinological Congress held in Berlin, August, 1911.

In the researches of Lewis and myself,[1] twenty-six specimens were examined from sixteen persons and only three were sterile. Thirteen were monoorganismal, nine showed two varieties of organism, while in one specimen a combination of three varieties of bacteria was met with. The pneumococcus was present in four, the micrococcus pyogenes in thirteen, and streptococci in six specimens. Other organisms such as the bacillus of Hoffmann, Friedländer's bacillus, B. mesentericus, B. proteus, and B. aureus were also isolated. In only two of the healthy cavities were the organisms pathogenic, the streptococcus pyogenes in one proving fatal to a rabbit in fourteen days. Allen[2] examined twenty normal noses and none of them were sterile; the micrococcus pyogenes var. albus and aureus were isolated in fifteen; Gramcocci of the pseudocatarrhalis group were found in four.

With regard to the postnasal space, we find that C. E. West in his recent researches upon the bacteriology of chronic nasopharyngeal catarrh, which will be referred to presently, formed the opinion that the bacterial flora in health differed very little from that found in chronic catarrh. Reference will be made later to the occurrence of the tubercle bacillus in the normal nasal cavities.

The Healthy Accessory Sinuses.—Bacteriologic investigation of the healthy accessory sinuses does not seem to have been carried out during life, the difficulty of doing so without contaminating the swab employed being obvious. Törne[3] has examined the frontal and maxillary sinuses in thirty-six cadavera; in twenty-two the cultures were made within two and a half hours of death, and in all of them the sinuses were found sterile. Of the remaining fourteen cases examined from three to twenty-five hours after death, seven were still sterile and seven contained bacteria. There is thus evidence to show that these sinuses at any rate are free from bacteria during life. E. Fränkel[4] had previously examined the normal accessory sinuses, some within eight to ten hours, and all within twenty-four hours, after death. In twenty-eight cadavera thirteen were quite sterile, while of the remainder some contained one, others several forms of bacteria. The pneumococcus and varieties of the micrococcus pyogenes were found. Fränkel concluded that these cavities may contain organisms in their normal condition during the life of the individual, but he does not appear to have examined them bacteriologically so recently after death as did Törne.

Bacteriology of the Nasal and Postnasal Cavities in Acute and Chronic Catarrhal Conditions.—Allen[2] has examined the nasal mucus in forty cases of acute catarrh or "common" cold. The micrococcus catarrhalis was isolated in nineteen, the bacillus coryzæ segmentosus in eighteen, and the bacillus of Friedländer in fourteen. The bacillus influenzæ was only once found, but during the periods at which these examinations were conducted no influenzal epidemic had visited the district in which the individuals were living. Walter[5] has tabulated one hundred cases of acute, subacute, and chronic rhinitis. The micrococcus pyogenes var. albus, citreus, and aureus occurred in 56 per cent; the bacillus coryzæ segmentosus of Cautley in 35 per cent; and the micrococcus catarrhalis in 20 per cent. Friedländer's pneumobacillus and the pneumococcus of Fränkel were each regarded as causal organisms in 7 per cent. The B. influenzæ was never found though an influenzal rhinitis was prevalent in the district. With regard to our own observations,[1] thirteen specimens were examined from eight cases of acute nasal catarrh and one of chronic postnasal catarrh. The streptococcus pyogenes appeared to be the exciting cause in six, and the micrococcus pyogenes in two, of the acute cases. The pneumococcus was only once found. The bacillus of Hoffmann, the pseudodiphtheria bacillus, and the B. mesentericus were amongst the other organisms isolated.

Bacteriology of Chronic Nasopharyngeal Catarrh.—C. E. West[6] has given us the result of his recent investigations on the bacteriology of fifty cases of chronic postnasal catarrh. The cases were essentially of a chronic nature, and had been under observation for a considerable period of time, the majority of them having used an alkaline nasopharyngeal wash for weeks and even months. The sparsity in the number of bacterial types was a feature of the investigation. The pneumoccus occurred more frequently than any other organism, being found in no fewer than 70 per cent of all the cases, occurring in pure culture in 36 per cent. Streptococci were isolated in 24 per cent of the plates, being the predominant organism, however, in only two cases, and never in pure culture. In the majority of the cases the streptococcus salivarius was the type observed. The micrococcus pyogenes var. aureus occurred in large numbers in 26 per cent, usually associated either with the pneumococcus or the streptococci. On several occasions a coccus morphologically indistinguishable from the meningococcus occurred in considerable numbers, in one instance being found in almost pure culture. The micrococcus catarrhalis was only isolated four times, i. e. in 8 per cent, while Friedländer's pneumobacillus occurred in 12 per cent, being the predominant organism in half of these.

Gourc,[7] Lartigan and Nicoll[8] have examined the secretion lying upon the surface of adenoid vegetations after their removal by operation. A variety of organisms were cultivated from it—the streptococcus pyogenes, the micrococcus pyogenes var. albus and aureus, the pneumococcus and various diplococci being obtained.

Bacteriology of Inflammatory Conditions of the Accessory Nasal Sinuses.—The following observations are from our own work[9] and from some hitherto unpublished cases, for which I am indebted to my friend, Dr. F. Esmond Reynolds. In twenty-two cases of acute and chronic frontoethmoidal sinus suppuration, which were operated upon, the pneumococcus was isolated in eight, or 36 per cent; the streptococcus pyogenes in nine, or 40 per cent; and varieties of the micrococcus pyogenes, albus, aureus and citreus flavus in ten, or 45 per cent. A bacillus closely resembling the influenzal bacillus occurred in one case. In forty-three cases of maxillary sinus inflammation the pneumococcus was present in thirteen, or 30 per cent; the streptococcus pyogenes in thirty-three, or 76 per cent; and varieties of the micrococcus pyogenes in thirty-four, or 79 per cent. The B. influenzæ was isolated in one, the tubercle bacillus in one, and the micrococcus catarrhalis in two.

It is obvious, therefore, from the brief foregoing account that a variety of microorganisms may be found in the healthy nasal and postnasal cavities of most individuals, and also in the same cavities and in the accessory nasal sinuses of many persons who are apparently in the enjoyment of excellent health but who are at the same time suffering from a chronic catarrhal or mucopurulent inflammation of the mucous membrane of their upper respiratory passages. The chief organisms which are found and which demand our attention are the pyogenic cocci, the pneumococcus, the micrococcus catarrhalis, the influenza bacillus, the meningococcus and the bacillus tuberculosis. In the healthy upper air passages the bacteria are frequently in smaller numbers, in pure culture, of lower vigor, and of little or no virulence as compared with the organisms which are present in the inflammatory conditions. In the latter they grow with vigor in subcultures and are frequently pathogenic to animals. From a variety of causes, however, such as debility, chills, traumatism, diminishing the tissue resistance, or from the introduction of a fresh organism, bacteria previously quiescent or avirulent may become active and give rise to acute infections.

General Scheme of the Investigation.—In the following table I have indicated the various organismal infections which may have a primary focus in the nasal and nasopharyngeal cavities, and which will now be considered. It has already been shown that the organisms which produce them may be cultivated from these cavities in their healthy state or in simple catarrhal conditions. Although it is possible to demonstrate in some instances the lymphatic channels as pathways of infection, in other conditions again we cannot do more than assume that the lymphatic vessels may be the avenues along which the organisms are carried to neighboring structures.

A. From the nasal and nasopharyngeal cavities to the cerebrospinal meninges—

(a) Suppurative meningitis (pyogenic organisms).

(b) Influenzal meningitis (Pfeiffer's bacillus and allies).

(c) Pneumococcal meningitis (the pneumococcus).

(d) Epidemic cerebrospinal meningitis (the meningococcus).

(e) Acute poliomyelitis.

(f) Tuberculous meningitis (bacillus tuberculosis).

B. From the nasal and nasopharyngeal cavities to the cervical lymphatic glands—

Glandular enlargement and pulmonary disease (bacillus tuberculosis).

While the chief function of the various meningeal spaces with the fluid contained within them has been long regarded as serving as a protection to the brain against alterations in pressure, anatomists in more recent times have looked upon them as lymph spaces. Schwalbe first demonstrated by injection of the subdural space paths of communication between it and the olfactory mucous membrane, the perilymphatic space of the labyrinth, and the perichoroidal space. Key and Retzius by injecting the same region were able to follow the injection into lymphatic vessels, which left the skull through the jugular foramen and carotid canal. They were also able to inject from the subdural space lymphatic vessels in the nasal mucous membrane. Flatau[10] was able to inject the lymphatic vessels of the nasopharynx from the subarachnoid space. Cuneo and André[11] have succeeded in young human subjects in injecting a lymphatic network in the pituitary membrane from the meningeal spaces, the vessels traversing the cribriform plate by small canals which are independent of the small olfactory nerve branches. This lymphatic network would appear to belong exclusively or almost exclusively to the olfactory region, and in this way resembles the similar extensions into the inner ear and the globe of the eye.

Our knowledge of the arrangement and distribution of the lymphatic apparatus of the accessory sinuses is still very meagre, and we are unable to give any descriptive account of them.

A. NASAL AND POSTNASAL CAVITIES TO THE CEREBROSPINAL MENINGES.

The number of cases of intracranial complication—meningitis, abscess, and sinus thrombosis—which have followed primary inflammation and suppuration in the nasal cavities and their accessory sinuses now form a fairly extensive series in literature. While the possibility of extension of the inflammation by way of lymphatics has been frequently considered, there can be no doubt that these structures probably play only a subordinate part as avenues of infection between the nasal cavities and the cranial contents. The difficulty in demonstrating anatomically a lymphatic connection between the upper air passages on the one hand and the cranial cavity on the other naturally increases our difficulty in proving the passage of microorganisms by such a route. Moreover, both on the operating table and in the postmortem room it has been so frequently shown that infection spreads in the majority of cases as a result of a carious or carionecrotic condition of the contiguous bony walls of the adjacent cavities or after complete destruction and perforation of the same. In other cases, again, the venous channels which pass directly through the adjacent walls or indirectly from the nasal sinuses through the orbit by way of the ophthalmic veins to the cavernous sinus constitute another pathway of infection. When neither macroscopic nor microscopic evidence of any of these avenues can be found, it may then be legitimate to assume that the lymphatics, if such exist, have been responsible for the propagation of the infection to the brain and its coverings. We have endeavored in the following description to analyze the evidence in favor of the latter route of infection in meningitis.

(a) *Pyogenic or Suppurative Meningitis.*—Examination of the monographs of Dreyfuss and Gerber, who deal at great length with the intracranial complications of nasal and accessory sinus suppuration, shows how scanty are the references bearing upon lymphatic infection. The former quotes the cases of Quinlan and Wagner, in which death from meningitis followed the application of the cautery to the nasal mucous membrane. As no postmortem examination was made in either case, direct evidence as to the path of infection is wanting, but the lymphatic or venous channels may offer the possible explanation, as death followed rapidly upon the operation. Death from meningitis has followed removal of nasal polypi, and of the middle turbinated bone in patients suffering from ethmoidal suppuration, and more than one fatal result from a similar complication has occurred after submucous resection of the nasal septum in nasal cavities devoid of any suppurative focus. I have been unable to find any detailed postmortem report as to the mode of infection in these cases. Hayen reports a case of epistaxis in which a chemist plugged the nose with tampons soaked in perchlorid of iron. The patient died a few days later with symptoms of meningitis. At the postmortem the whole length of each olfactory sulcus had a brown discoloration and the nerve substance reacted to Prussian blue. It was evident that the perchlorid of iron had reached the brain along the nerve branches passing through the cribriform plate. In ten cases of ethmoidal cell suppuration with intracranial complication cited by Dreyfuss, perforation or disease of the cribriform plate was found in three, in one perforation of the lamina papyracea, in one the infection spread by way of the orbit, and in one no statement was made as to the pathologic condition present in the bone. In the remaining five there was no naked-eye evidence of disease of the lamina cribrosa. Four of the latter were acute cases of sinus suppuration, in which death supervened so rapidly that destruction of the bone was not possible; in them death resulted from basal meningitis, which was well marked over the ethmoid plate. Unfortunately no microscopic examination was made of the ethmoid bone.

Twelve cases of fatal intracranial complication secondary to sphenoidal sinus suppuration are quoted by the same author. In only one case, namely that published by Ortmann, was a microscopic examination made of the mucous membrane and osseous wall of the sphenoidal cavity. In the mucosa, periosteum, osseous tissue, and dura mater numerous diplococci and pus cells were observed. The intracranial affection in this case was an extradural abscess in the sella turcica with thrombosis of both cavernous sinuses secondary to periostitis and osteitis of the sphenoidal sinus. There was no evidence microscopically of lymphatic invasion. The existence of cavernous sinus thrombosis indicated an extension of the infection through the small venous channels penetrating the bony wall of the sphenoidal sinus and opening into the cavernous blood space.

In Gerber's classical monograph, "Die Komplikationen der Stirnhöhlenentzündungen," published in 1909, 160 cases of intracranial complication secondary to frontal sinus inflammation have been collected and carefully analyzed. Of twenty-eight cases of extradural abscess, one reported by Gyselynck and Mayer was regarded as probably due to infection by way of lymphatic channels. The case was one of acute frontal sinus inflammation due to streptococcal infection. The sinus walls at the operation showed no defect. As the patient recovered, proof is wanting as to the exact manner of the infection. In fifty-one cases of purulent leptomeningitis and fifteen cases of thrombophlebitis none were ascribed to lymphatic infection. In only one of sixty-six cases of brain abscess was the infection regarded as propagated by the lymphatic vessels. The case which was published by Hoffmann was one of chronic bilateral frontal sinus suppuration complicated with abscesses of streptococcal origin in both frontal lobes. A perforation of the posterior osseous wall was found in the right frontal sinus, but Hoffmann regarded the lymphatics as the path of infection to the left frontal lobe from the left frontal sinus. Unfortunately no microscopic examination was made.

It is obvious, therefore, that the conclusive proof of intracranial infection by pyogenic organisms from the nose by way of lymphatic vessels requires more direct evidence than has yet been obtained. In addition to the cases already mentioned, others are recorded, e. g. those of Huguenin, Ogston, and Warner, in which to the naked eye no bone lesion was apparent, Ortmann's case, however, demonstrates the fact that even in such instances microscopic examination proves that the infection will spread through the bony walls by continuity of inflammation; therefore one is not justified in assuming that, because there is no macroscopic change in the bone, the infection must in consequence have spread by lymphatics. In all fatal cases of this kind a more minute histopathologic examination is very desirable.

(b) and (c) *Pneumococcal and Influenzal Meningitis.*—It will serve our purpose equally well and prevent needless repetition if pneumococcal and influenzal meningitis are considered together. Both Fränkel's pneumococcus and Pfeiffer's bacillus may be found together in the nasal secretion, and the latter has been found in a few cases of meningitis, sometimes alone and sometimes in association with pyogenic cocci. Pfühl[12] is of the opinion that in these cases the path of infection to the brain is directly through the roof of the nasal cavity. Although meningitis due to both of these organisms may result from a blood infection there is evidence of direct meningeal infection from the nasal, postnasal, and accessory nasal cavities. As proof of this statement it is not necessary to do more than cite a few illustrative cases. It is true that the same difficulty which was found in proving a lymphatic connection in pyogenic affections is again encountered here, and we are forced to assume rather than bring proof of the exact pathway of infection. Weichselbaum has drawn attention to the possibility of the inflammation spreading from the meninges to the nasal cavities. In the cases of primary acute meningoencephalitis investigated by Weichselbaum[13] from which the pneumococcus was cultivated, the same organism was found in the nasal accessory sinuses and middle ear cleft in four instances. The examination of the relative degree of the inflammation existing in the meninges on the one hand and the accessory nasal cavities on the other forced him to conclude that the infection had spread from the nose and pharynx by way of the sinuses and middle ear cleft to the meninges. The same author[14] has recorded a case of acute leptomeningitis and frontal lobe abscess due to the pneumococcus in a young man suffering from influenza, in whom the right maxillary and frontal sinuses were affected.

It is regrettable that a complete examination was not made in Zörkendörfer's[15] case. The patient was a woman, aged 30, who was brought to the hospital in an unconscious condition. Two days previously she had suffered from a rigor. Her temperature was elevated. She became comatose, and developed rigidity of the neck and paralysis of the right facial nerve. Two days after admission she died. Postmortem examination revealed redness and detachment of the mucous membrane of the nasal and ethmoidal cavities, and the mucosa of the sphenoidal sinuses was covered with thick pus. The other organs showed no evidence of disease. There was a well-marked leptomeningitis both of the convexity and of the base of the brain. Fränkel's pneumococcus was found in the meninges and in the pus in the sphenoidal sinuses. Microscopic sections demonstrated the piaarachnoid infiltrated with round cells. The meningeal vessels were filled with blood, the leucocytes being increased in number, in some places half of the lumen being filled with dense masses of the same. Zörkendörfer concluded from this examination that the pneumococcal immigration did not take place by way of the blood-vessels, because the large leucocyte masses within the blood-vessels were free from bacteria, whereas the meningeal exudate was infiltrated with cocci, He was therefore inclined to the view that the passage of the organisms into the cranial cavity had taken place either by the lymph channels or by the inflammation spreading by continuity of tissue through the walls of the sphenoidal sinus to the membranes. It is unfortunate that no histologic examination of the bone was made.

Grober[16] has recently discussed the path of infection in pneumococcal meningitis and considers that it may be by the lymphatic channels as well as by the blood vessels. He regards the lymphatic tissue of the nasopharynx and pharynx as a portal of infection in pneumococcal meningitis, the organisms normally present in the nose and mouth finding ready access under pathologic conditions. As regards the pathway from the portal of entrance to the meninges, he says further investigation has yet to be made. Two cases bearing upon direct infection from the upper air passages are recorded in Grober's paper. In the first case, as the result of a fall upon the occiput, a fracture of the base of the skull passed through the root of the nose and the ethmoidal bone. The patient died without any evidence of pneumonia. He discusses the question as to whether the organisms gained entrance through the injury to the scalp or reached the meninges from the nose, and he decided upon the latter route. The second case was that of a child, aged 8, who developed all the signs of meningitis; spinal puncture revealed the presence of pneumococci in the cerebrospinal fluid. The posterior wall of the pharynx, uvula and tonsils was markedly inflamed from the very outset of the symptoms. All the other organs were healthy, and there was no clinical evidence of pneumonia. The child recovered under treatment with Römer's serum.

Meningitis due to Pfeiffer's influenza bacillus, although not common, is now well recognized. Pfühl[12] was the first to demonstrate the presence of the bacillus in the meningeal exudate. Dubois has collected eleven cases of meningitis in which the bacillus was present, and many other cases are recorded. The question of the portal of entry of the bacillus influenzæ into the central nervous system has been much discussed. We have already referred to the presence of the organism in the nasal and accessory cavities, and the fact that the common type of influenza is the respiratory one, often characterized by an acute rhinitis, would suggest the nose and nasopharynx as a probable portal of entry. E. Fränkel is an advocate of the hypothesis that the bacilli are conveyed by the lymphatics of the nasal mucosa through the cribriform plate directly into the cranium. While the theory is plausible, postmortem evidence of this pathway of infection is not satisfactory. Ghon[17] has reported the case of a man dying of influenzal meningitis. The mucous membrane of the nasopharynx was red and swollen and covered with a mucopurulent discharge; in the right frontal sinus there was a quantity of yellow pus, while the mucous membrane of the right antrum was swollen and the cavity contained exudation. There was a leptomeningitis of the right cerebral hemisphere. The mucosa of the larynx and trachea was also inflamed and a lobular pneumonia existed. The meningeal exudate, as well as that in the frontal and maxillary sinuses and in the nasopharynx, contained a similar organism, colonies of which were identical in appearance to that of the bacillus influenzæ.

Pencker, Mya, Cagnetto, Cohen, Hecht, Langer, James Ritchie, and others have reported cases of meningitis associated with an influenza-like bacillus, occurring at a time when influenza did not exist in an epidemic form. The subject is thoroughly discussed by Ritchie[18] and is referred to here on account of the possibility of the meningeal infection being secondary to a nasal and nasopharyngeal inflammation. The cases are apparently sporadic, and young children are affected. The condition is extremely fatal. Although in some cases the meningeal affection has been part of a general pyemic process, a further point of note is the frequent association of the meningitis with middle ear suppuration or with suppuration of the frontal or maxillary sinuses. While it must be borne in mind, in the light of certain of the cases showing evidence of a general pyemia, that the pus in these cavities and in the meninges may arise from some common source of infection elsewhere in the body, a provisional opinion may be expressed that in many of them, perhaps in the majority, the meningitis results from the spread of an infective condition from the nasopharynx.

(d) and (e) *Epidemic Cerebrospinal Meningitis and Acute Poliomyelitis.*—These two diseases of the central nervous system possess certain features in common which justify us in briefly studying them together. They occur both in epidemic form and as sporadic cases, and they must be regarded in the light of acute infectious diseases. They attack by preference infants and young children. What is of chief importance, however, in connection with our subject is the fact that the virus in both conditions is found in the nasopharynx, and appears to have a predilection for invasion of the nasopharyngeal mucous membrane, and from there to pass, presumably by the lymphatic system, to the central nerve apparatus. It should be pointed out that Flexner has been able to demonstrate in monkeys the passage of the meningococcus within the leucocytes from the meninges into the nasopharynx, so that in cerebrospinal meningitis the nasopharyngeal mucous membrane may serve both as an exit and as an entrance for the organism. In man it is naturally difficult to establish the former. Although no organism has yet been identified in the production of acute poliomyelitis, Flexner has demonstrated experimentally that the disease can be conveyed to monkeys by inoculating an emulsion of the virus from fatal cases in man; further, that the disease can be transmitted through a series of monkeys. Up to the present time investigators have failed to demonstrate the virus as an entity visible through the microscope.

Cerebrospinal Meningitis.—We have already referred to the presence of the meningococcus in the nasopharynx in West's series of investigations in cases of chronic nasopharyngeal catarrh, and many observations might be quoted as to its occurrence in the nasopharynx, not only in those who have been victims of the disease, but also in those who have been in contact with patients, and who must be regarded as carriers. Westenhöffer's researches and those of Lingelsheim have made it more probable that the nasal cavities proper and the accessory sinuses do not serve as the portal of infection in the same way as does the nasopharynx. The former[19] in thirty postmortem examinations upon fatal cases of the disease, found the ethmoidal cell labyrinths almost always free from inflammatory disease. Bacteriologic investigation confirms this, because in the secretion from the nasal vestibule and anterior part of the cavities the meningococcus was seldom isolated, whereas it was very frequently found in the secretion from the posterior part of the nasal cavities and the nasopharynx. Lingelsheim's observations are of a similar nature.

Edmund Meyer[20] examined a number of children affected with the disease during the epidemic in Upper Silesia in 1905. The nasopharynx was examined during the early days of the affection, and in spite of the difficulties attending posterior rhinoscopic examination well marked inflammatory changes were observed in the nasopharynx. Some of his observations were confirmed by postmortem examination. In the other organs examined after death no changes or only very unimportant ones were recognized. If the nasopharynx could be observed before the onset of the meningeal symptoms, more valuable proof of this portal of infection would be obtained. In the only case in which Meyer observed the outbreak of the disease, nasopharyngeal symptoms preceded the others. Busse[21] has also given attention to this point and has confirmed the observations already made, and has satisfied himself that in the rapidly fatal cases redness and swelling of the mucosa with excess of secretion in the nasopharynx existed, while in the cases following a slower course the changes in the mucous membrane were more advanced.

If these facts be accepted, the question naturally arises as to the pathway of the organisms to the meninges. The evidence is somewhat conflicting as to the part played by the sphenoidal sinus. This cavity does not commence to develop until the third year of life, therefore in many young children, who form so large a proportion of these cases, this route cannot be considered. Meyer examined clinically one hundred cases of the disease and was of the opinion that the sphenoidal sinuses were not affected. Westenhöffer made a routine examination of the accessory sinuses postmortem, and in the acute stage frequently found swelling of the mucous membrane with mucoid exudation and sometimes pus in the cavity. Meyer made serial sections of the nasopharyngeal tonsil, but was unable to detect the organism in the deeper parts. He only observed it upon the surface. The frequency of inflammation in the middle ear cleft in cases of cerebrospinal meningitis raises the question as to whether it may not take part in carrying the infection from the nasopharynx to the meninges. Hirsch has pointed out that in the early stages of the disease patients may complain of ear symptoms. The question arises, therefore, as to whether the labyrinthine disease so frequently met with in this affection may not result from infection spreading from the middle ear rather than as a labyrinthitis secondary to the meningeal inflammation, as has so long been held to be the case. In this as in the other forms of meningitis already discussed the part played by lymphatic vessels in the propagation of infection is still open to further investigation.

Acute Poliomyelitis. Flexner[22] believes that the nasal mucous membrane serves not only as the portal of infection, but also as the path of elimination of the virus, and he further considers that all the theoretical conditions required to establish the nasomeningeal route as the direct one for infection have been supplied by experiment. In the report of the Collective Investigation Committee of the New York Epidemic of 1907, Wickham has called attention to the lymphatics as the route of infection. Flexner and Lewis have shown that the virus will travel up the sheath of the sciatic nerve. The question naturally arises, therefore, as to whether the infection may spread from the upper respiratory passages to the meningeal spaces. Harbitz and Schoel in the one case which they were able to examine microscopically could not find any evidence of infection passing along the olfactory nerves, and the nasal and accessory cavities were normal. Levaditi[23] was unable to inoculate the nasal mucous membrane with the virus with any positive result. The more recent observations of Sohier Bryant[24] tend to show that nasopharyngeal catarrh is very prevalent in communities in which poliomyelitis exists, while the experiments of Osgood and Lercas[25] demonstrated that it was possible to transmit from monkey to monkey a typical poliomyelitis from the filtrate of the nasopharyngeal mucosa of two monkeys dying without any other obvious infection six weeks and five and a half months respectively after the acute stage of the disease. In all probability further light will be thrown upon the transmission of this acute infectious disease in the immediate future.

(f) *Tuberculous Meningitis.*—Considerable discussion has from time to time arisen as to the part played by the nasal and postnasal cavities as pathways of infection in tuberculous meningitis. The existence of tubercle bacilli in the healthy nose and their presence in adenoid vegetations, the occurrence of primary nasal tuberculosis as a more common affection than was at one time realized, and the close proximity of the cavities to each other would naturally lead us to assume that infection of the meninges by way of the nasal passages might not infrequently occur. Weigert, indeed, believed that this was the usual mode of infection.

Experimental work upon the production of meningitis by inoculating the nasal mucosa with tubercle bacilli has been carried out by Magunna and Knowles Renshaw and others. The former investigator[26] used an emulsion of a culture of bacilli, in some cases injecting the mucosa with a few drops by means of a Pravaz syringe as far back in the nasal cavity as possible, in other cases merely laying a few drops of the emulsion upon the healthy surface of the olfactory mucous membrane. Of the twenty guinea pigs thus inoculated six died of meningitis. Of the six cases in which inflammatory changes were found in the cerebral membranes, three had been inoculated beneath the mucous membrane, while in the remaining three the surface had merely been smeared with the emulsion.

The animals lived from sixteen days to one month after the experiment. In all the animals the nasal mucous membrane was congested, and in four granulations were also present. In the first experiment these granulations are described as miliary tubercles; when examined microscopically no bacilli were found in them, and they were not used for further inoculation experiments. In all the cases the meninges were congested, while in three granulations were also found. The changes were most marked at the anterior part of the brain, and in three of them special reference is made to the intensity of the inflammation in the region of the cribriform plate. All the animals lost weight.

Knowles Renshaw[27] infected the nasal mucous membrane of guinea pigs with tubercular sputum, the part of the nasal cavity selected being the superior fossa. In three it was introduced in the fluid state through a small silver canula, while in the fourth a piece of dried sputum was introduced by means of a piston through the canula. In order to avoid any bruising of the mucous membrane, chloroform was administered in each case. Three animals were killed on the twenty-seventh, fifty-seventh, and fifty-fourth days respectively, while the fourth animal died on the ninety-eighth day. In none of these experiments was meningitis produced. Although Magunna's observations supply experimental evidence of the direct spread of inflammation from the nasal cavity to the meninges, no proof is forthcoming as to the path of infection, as apparently the tissues were not subjected to any histologic examination. For the same reason it is not definitely proved in these experiments that the resulting meningeal infection was of a tuberculous nature. The anatomic researches of André upon the naso-meningeal communications show that the lymphatic network occupies the olfactory portion of the nasal cavity, and is distributed upon the upper fourth or third of the nasal septum and external wall of the cavity. The extent of this area will doubtless vary, therefore, in different animals. At the same time it might exert an important influence upon the seat of inoculation in experimental work. Renshaw placed his tuberculous material in the upper part of the cavity without injuring the mucous membrane, and we may presume from this description that the olfactory region was reached. No meningitis, however, developed. Magunna, in three experiments in which the mucosa was injured, passed the needle of his syringe to the posterior part of the nasal cavity; also in three experiments in which no injury was inflicted the olfactory mucosa was smeared. In all his experiments, however, pathologic changes in the meninges of the anterior cerebral fosa were observed. In two experiments carried out for me by Dr. J. S. Fraser, in which the anterior part of the nasal fossa was inoculated, no meningeal inflammation was set up.

Demme's case[28] has often been quoted as furnishing evidence of tuberculous meningitis secondary to a focus in the nasal cavity. The patient was a child, aged 8 months, without any antecedent history of tuberculosis or syphilis. When 4 months old the child had been put out to nurse in a family, the father of which suffered from acute pulmonary tuberculosis. When 6 months of age a discharge from the nose was observed and examination revealed the presence of small ulcerated granulations. In the secretion from the nose a large number of tubercle bacilli were found. Without any apparent cause the child developed symptoms of acute meningitis, and died four days afterwards. At the autopsy tuberculous meningitis at the base of the brain was found, many miliary tubercles being scattered along the vessels, especially about the anterior and inferior cerebral veins. No tubercle was observed in the substance of the brain or the cerebellum, no caseous foci existed in the lungs, bronchial glands or other organs, which were quite healthy. The mesenteric and axillary glands were slightly swollen. No examination of the ethmoidal region was made, but the nasal mucous membrane was examined microscopically by Langhans, who reported upon the presence of tubercle bacilli associated with giant cell systems. Huey[29] has reported a case of extensive tuberculous disease of the left nasal cavity in a patient who submitted to an operation for the removal of some of the tissue. Three weeks later headache, vertigo, fever with delirium, strabismus and ptosis developed, which was followed in eight days by coma and death. No postmortem was obtained. Clinically, no lesion could be demonstrated in the chest. Huey concluded that the meninges had become directly infected from the nasal cavity.

Summary.—It is evident from the foregoing account that the part which has been assigned to lymphatic vessels in carrying infection from the upper air passages to the cerebrospinal cavities is largely speculative, and that definite pathologic proof of the same is still wanting. It appears from the data collected that some writers have given to lymphatic channels between the nasal and accessory nasal cavities on the one hand, and the central nervous system on the other, a position which is hardly justified by anatomic facts as at present known. Even granting that future investigation may demonstrate a well-developed network of intercommunication, the lymph-flow through it will take a direction from the brain towards the nasal cavities and cervical lymphatic glands. Consequently the danger of meningeal infection by such an avenue from organisms in the nasal cavities, will be diminished. The experiments of Flexner already referred to, that the meningococcus will pass from the meninges into the nasopharynx and that the nasopharyngeal mucous membrane thus serves as a gate of exit for the organism, furnish experimental evidence upon this point. In the great majority of cases of chronic nasal suppuration in which an intracranial complication has developed, evidence has been found demonstrating the spread of the infection through disease of the contiguous bony wall. In cases of meningeal infection, however, in which no chronic nasal disease has existed, and in which destruction of the bony walls has therefore not been possible, some other path of infection must be looked for. This may be, and in some cases has been, definitely shown to be by venous channels. It will require further investigation, first along anatomic lines, and secondly by careful microscopic examination, both in experimentally induced meningitis and in fatal cases in which nasal and accessory sinus disease has furnished the primary focus of infection, to prove that such infection may take place by lymphatic channels.

B. TUBERCULOUS INFECTION OF THE CERVICAL LYMPHATIC GLANDS AND LUNGS FROM THE NASAL AND NASOPHARYNGEAL MUCOUS MEMBRANE.

It is intended in this part of the subject to illustrate the relation of the lymphatic system of the nasal and postnasal cavities to other parts of the body by means of the tubercle bacillus. We are thus at once brought into touch with the question of the main avenues of infection of tuberculosis, namely, by inhalation, ingestion, and lymphatic invasion. The problem which interests us is not so much one of aerogenic or inhalation as opposed to ingestion or deglutition tuberculosis, but rather of aerogenic versus lymphatic invasion. In other words, to what extent are the lungs primarily infected by inhalation of material containing tuberculous virus, or in what proportion of cases are they infected through the cervical lymphatic system from inoculation of the nasal and nasopharyngeal mucous membrane. The lines along which research has been conducted have been anatomic, experimental, and clinical, and it is our intention to discuss the subject in the same way.

Anatomic Considerations.—The regional lymphatics of the nose and nasopharynx so ably worked out in recent years by Most[30] may be briefly summarized here in order to make more clear the clinical points which follow. With the exception of a small area of mucous membrane in the anterior part of the nasal cavity from which the lymph channels pass forwards on to the face, the main lymphatic drainage passes backwards through the choanæ. The lymphatic vessels, along with those from the nasopharynx and from the palatal arch and faucial tonsil, terminate in the superior deep cervical glands, some of which lie along the internal jugular vein, while others are placed more laterally beneath the sternomastoid muscle and upon the anterior scaleni muscles. The lymph flow from both these groups passes into the inferior deep cervical glands, which, like the superior, lie in two groups, one placed more superiorly and externally in the supraclavicular triangle, the other more mesially placed in relation to the internal jugular vein and common carotid artery extending behind the inner end of the clavicle. The efferent vessels from the inferior deep cervical glands form a common lymphatic jugular trunk, which opens on the right side of the neck into the veins at the junction of the internal jugular and subclavian veins, and on the left side into the terminal bend of the thoracic duct.

It is necessary for our purpose to note further the lymph flow in the mediastinal glands. The tracheal and bronchial glands receive their afferent vessels from the mucous membrane of the trachea, the bronchial tubes, and pulmonary alveoli. The efferent vessels from the tracheobronchial glands, along with the majority of the parietal and the whole of the visceral lymphatics of the thorax, assist in forming a bronchomediastinal trunk, which terminates like the jugular trunk in the large veins at the root of the neck upon the right side and in the thoracic duct on the left side.

It is evident, therefore, anatomically, that the lymphatic drainage of the nose and nasopharynx passes through the deep cervical glands into the venous circulation at the root of the neck, and has no direct communication by efferent lymph vessels with the tracheobronchial glands. Similarly, the lymph from the tracheobronchial glands passes into the venous circulation, and has no direct communication with the inferior deep cervical glands. The supraclavicular glands, however, receive certain afferent vessels from the arm, the integuments of the pectoral region, and also from the mamma.

Most has drawn attention to the difficulty in injecting from the pharynx the inferior deep cervical glands lying in the supraclavicular triangle. Lasagna[31] has recently confirmed these observations. He injected with colored material the superior deep cervical lymphatics, and in forty-one out of forty-two cadavera the material passed into the large veins quite independently both of the group of glands in the supraclavicular triangle and of the tracheobronchial glands. While anatomic investigation has apparently failed to establish a direct communication between the mediastinal glands and the deep cervical glands in the supraclavicular triangle, there would appear to be clinical evidence to the contrary. This would appear to be a suitable place to refer to clinical observations in this connection. When the supraclavicular glands are found enlarged without any evidence of the enlargement of the superior deep glands in the cervical chain, the attention of the clinician is naturally directed to the thorax in seeking a cause for the enlargement of the former. The following two cases which have recently come under my observation bear upon this point: A. S., aged 50, had suffered from hoarseness for three months; he was becoming thinner, and had lost one and one-half stone in six months. He first noticed enlarged glands above his right clavicle three months before he came under observation. He had had no respiratory trouble and no difficulty in swallowing. The left vocal cord was fixed in the cadaveric position. The glands above the right clavicle were hard and gave the impression of being malignant. The superior deep cervical glands were not enlarged. Examination of the chest revealed an area of dullness to the left of the sternum; an X-ray picture showed a distinct abnormal mediastinal shadow. A diagnosis of malignant disease of the mediastinal glands was made, with involvement of the left recurrent laryngeal nerve.

The second case was that of a woman who had had her right breast removed for malignant disease. She had suffered from hoarseness for two and a half months before she came under observation, and more recently she had noticed enlargement of the glands above her right clavicle. Her left vocal cord was fixed in the cadaveric position. In this case we had no post-mortem information regarding the condition of the intrathoracic organs. While it might be argued that the enlargement of the right supraclavicular glands was due to a secondary growth spreading to them by way of superficial lymphatic vessels from the pectoral region, the associated paralysis of the left vocal cord indicated involvement of the left recurrent laryngeal nerve, presumably from enlarged glands within the thorax. Both cases, therefore, appear to us to furnish clinical evidence of communicating lymphatic vessels between mediastinal and cervical glands. It is possible, therefore, that the supraclavicular glands may occupy an intermediate position, receiving afferent vessels both from above and from below.

While the above facts represent the anatomic arrangement of the lymphatic drainage of the neck and the relation of the mediastinal and cervical lymph systems, we must now consider the evidence furnished by experimental and clinical data. Three propositions have been put forward as to the manner in which tubercle bacilli may pass from the cervical lymphatics to the lungs and mediastinal glands. We have, in the first place, that which is based upon the anatomic facts above described, namely, by way of the large veins to the right side of the heart and thence by the pulmonary artery to the lungs and tracheobronchial glands. Secondly, the thesis held by Klebs, Grober, Philip, Bacon-Wood, and others that the lowest of the deep cervical glands infect the apex of the lung by direct extension through the tissues. Thirdly, the view by Aufrecht[32] and others that an anatomic connection exists between the cervical and mediastinal glands, so that infection will pass direct from the former to the latter and thence to the lungs through adhesion of the glands to the pulmonary artery and the entrance of the bacilli into the blood stream through its wall.

Experimental Considerations.—Sufficient experimental proof has been brought forward by a number of observers to prove that tubercle bacilli inoculated upon the mucous membrane of the upper air passages will infect the cervical glands; it is unnecessary to dwell further on this well recognized fact. Experimental proof, however, as to the mode of extension of the infection from these glands to the bronchial glands or to the lungs is more difficult to obtain, because when the nasal or nasopharyngeal mucous membrane is inoculated with tuberculous virus the possibility of pulmonary infection by inhalation cannot be lost sight of. Consequently the difficulty in deciding as to the part played by the cervical glands in propagating the infection to the lungs is obvious. The assertion that the real pathway can be ascertained by noting the older and the more recent tuberculous changes may be true in some cases, but it cannot be always accepted as providing reliable data from which the correct deduction may be drawn. Thus if the cervical glands show evidence of advanced tubercular disease, while the changes in the lung and bronchial glands are of a more recent date, it would be natural to assume that the infection had spread to the last named structures from the pharyngeal mucous membrane by way of the cervical glands. We cannot, however, exclude the possibility of the pulmonary disease arising by inhalation as an infection quite independent of and possibly more recently than that of the cervical glands. That tuberculous infection may take place by a twofold portal of entrance is illustrated by the inhalation experiments of Louis Cobbett.[33] By spraying an emulsion of tubercle bacilli in front of guinea pigs he found that when the animals were killed after a few minutes or hours the lungs were found to be infected, while the cervical glands showed no evidence of tubercle. On the other hand, in seventeen animals similarly dealt with, which were allowed to live from five to thirty-six days, sixteen showed pulmonary and bronchial gland tubercle, the gland infection being secondary to that of the lungs. In thirteen of the animals the deep cervical glands were also affected, their infection taking place early in the course of the experiment and concurrently with the lung infection, but the disease had progressed more slowly in them, the bacilli being few in number.

Other difficulties which present themselves when we attempt to follow the path of infection taken by the tubercle bacillus are found in the fact that the bacilli may leave no sign to indicate their point of entry, and that they may be present in the glands without producing any histologic evidence of their existence there. Thus Bartel and Spieler[34] have demonstrated, by inoculating animals with the lymphoid tissue from the pharynx, that in 11 per cent. of cases tuberculosis could be produced, and yet in none of the specimens of tonsil used was there any microscopic evidence of tuberculous tissue. Similarly, as the result of inoculating cervical gland tissue into animals, tuberculosis was produced in 58 per cent of the experiments, while microscopic evidence of tubercle was only found in 45 per cent of the glands; the tubercle bacilli were scanty or could not be found. Numerous other investigators have carried out similar experiments. Further, it must be remembered that once the lungs have become the seat of tuberculous disease, the cervical glands may be secondarily infected by the tubercle laden sputum most commonly passing through the faucial tonsils, but possibly also in some cases through the nasopharyngeal lymphoid tissue. Again, nasopharyngeal secretions containing bacilli may be swallowed and the organisms taken up by the mesenteric lymph glands and thence conveyed to other groups of glands. For these reasons, therefore, it may be difficult to follow the exact pathway of infection.

The experiments of Knowles Renshaw[27] throw some light upon the path of infection from the cervical glands to the thorax. He inoculated the surface of the nasal mucous membrane of seven guinea pigs with sputum containing tubercle bacilli. In one group of animals, four in number, the entrance and the anterior and lower part of the nasal cavity were inoculated; in the second group of three animals the application was made to the superior and more posterior part of the cavity. In the former the animals were killed from twenty-eight to fifty-six days after inoculation. In all of them slight inflammatory changes were observed in the nasal mucosa. The respiratory passages were normal; the lungs and peribronchial glands were unaffected; the abdominal organs were healthy. Evidence of tuberculous disease was only found in the cervical glands.

In the second group, in which the more posterior part of the nasal cavity was inoculated, the three animals lived for fifty-four, fifty-seven, and ninety-eight days respectively. Caseous material, ulceration of the mucous membrane and tubercle bacilli were found in the nasal chamber in all of them. The pharynx, larynx, and trachea were normal. The lungs showed extensive tuberculous disease, and the bronchial glands were also tuberculous. The cervical glands were similarly affected. The liver and spleen were also tuberculous.

It is obvious from these experiments that a local nasal tuberculosis may be produced by merely painting the mucous membrane with a suitable virus and that the efferent lymphatic vessels will carry the infection to the cervical glands. They further demonstrate the fact that the bronchial glands only became infected in those cases in which the lungs were also involved. These experimental data support the anatomic facts already detailed. The question as to the mode of infection of the lungs requires consideration. Two avenues of infection are possible, either an inhalation tuberculosis taking place pari passu with the cervical gland infection or infection through the cervical lymphatics into the large veins and right side of the heart, thence to the lungs. In favor of the latter route is the character of the lung infection. In two the lungs were studded with tuberculous deposit, in the third there was "extensive disease of the lungs," or to quote Renshaw's own words more fully, "the infection was never confined to one or two foci, but consisted of numerous tubercles scattered fairly evenly through all the lobes of the lungs." This description suggests the miliary nature of the pulmonary tubercle such as would arise from infection carried through the pulmonary artery. Again, the presence of tubercle in the liver and spleen furnishes additional evidence of the bacilli having passed through the blood circulatory system. Knowles Renshaw considered that his experiments proved that the various organs had been infected through the lymphatic circulation in the following order:—superficial and deep cervical glands, peribronchial and retrohepatic glands, lungs, liver and spleen. The experiments seem to us, however, to furnish proof of infection by the first of the three avenues which we have described, and consequently support the more direct anatomic route.

Vallée[35] introduced several milligrams of living tubercle into the nasopharynx in twelve cattle. In no case was pulmonary tuberculosis induced. In four of the animals, however, tubercle was demonstrated in the retropharyngeal glands, in the cervical and in the tracheal glands. These experiments furnish proof of the direct passage of infection from the nasopharynx through the lymph paths to the cervical glands, but in the light of our anatomic knowledge they cannot be regarded as demonstrating the further passage of the organisms from the cervical to the tracheal glands. Even though the lungs remained unaffected, some of the bacilli may have found their way by inhalation to the trachea, where an infection of the mucous membrane would give rise to disease of the tracheal glands through their afferent lymphatics.

Clinical and Pathologic Considerations. — The tubercle bacillus has been identified by various observers in the healthy nasal cavities. Strauss[36] was able to demonstrate its presence in persons connected with hospital life by inoculating and infecting guinea pigs with the nasal mucus. Moeller[37] found the bacilli on three occasions in his own nose and also in the nasal secretion of the attendants and ward maids of a sanatorium. Noble Jones[38] was able to produce tuberculous disease in three animals out of thirty-one after inoculating them with the nasal secretion from healthy individuals. Von Besser examined eighty-one healthy persons without finding any tubercle bacilli in their nasal secretion. That tubercle bacilli may lodge in the nasal cavities and produce a localized tuberculous affection of the mucous membrane is shown by the number of cases of nasal tuberculosis met with. During the last four years fifty-six cases of this condition have come under observation in the Ear and Throat Department of the Edinburgh Royal Infirmary.

It is rare to find the tubercle bacillus in inflammatory conditions of the accessory sinuses. It was only occasionally isolated in our own observations.[1] Keckwick, Gaudier, and Coakley have each recorded a case of primary tuberculous infection of the maxillary sinus.

In the nasopharynx, however, mainly in connection with the nasopharyngeal tonsil, many investigators have demonstrated the presence of tubercle bacilli or changes in the lymphoid tissue dependent upon the bacillus. This evidence has been obtained partly by inoculation experiments and partly by histologic examination of the tissue removed by operation. I have only tabulated the results obtained in individuals in whom there was no reason to believe that tubercle existed elsewhere in the body, consequently all are cases of primary infection of the nasopharyngeal tonsil. The percentage of cases in which evidence of tubercle was found varied from 2, 3, 4 and 5 per cent to 12, 14, 16 and 20 per cent, giving an average of 6 per cent of adenoids harboring tubercle.

Author.	Tubercle	Cases Examined	Per Cent
Pilliet	3	40	7
Lermoyez	1	75	1
Dieulafoy	7	35	20
Gottstein	4	33	12
Pluder and Fischer	5	32	14
Piffl	3	100	3
Lewin	10	200	5
McBride and Logan Turner	3	100	3
Moure	1	40	2
Broca	0	100	..
Brindel	8	64	12
Luzzati	0	50	..
Scheibner	0	14	..
Wex	7	210	3
Hynitsch	7	180	3
Baup	1	48	2
Wright	0	51	..
Blumer	4	85	4
Lartigan and Nicoll	12	75	16
MacFayden and MacConkey	0	44	..
Ivens	1	35	2

Dieulafoy, whose percentage of twenty was obtained by inoculation experiments, has been criticised on the ground that the tubercle bacilli might have been in the secretion upon the surface of the tissue injected, while the adenoid mass may have been destitute of any evidence of tubercle. This possibility, however, does not affect our thesis, as we are concerned only with the presence of tubercle in the nasopharyngeal space. Lartigan and Nicoll's results, twelve positive findings in seventy-five specimens, or 16 per cent, were also obtained by inoculation. In eight of these tubercle bacilli and histologic evidence of tubercle were also found in the hardened tissues, while the remaining four contained tubercle bacilli without any histologic changes. The negative results of MacFadyen and MacConkey were also obtained by inoculation.

Having thus demonstrated the presence of tubercle in the lymphatic tissue of the nasopharynx, two illustrations of its extension to the neighboring lymphatic glands may be cited. These cases were reported some years ago.[39] A boy, aged 14, with a good family history, healthy looking and well nourished, and with no pulmonary disease, presented a mass of enlarged lymphatic glands involving the left superior deep cervical chain; the glands were matted together and formed a swelling about the size of a hen's egg. A large mass of adenoid hypertrophy occupied the nasopharynx. The adenoids and the hypertrophied cervical glands were removed. Evidence of tubercle was found in both situations. In the lymphatic tissue of the nasopharynx, tubercular giant cells, endothelioid cells and areas of degeneration were found but no tubercle bacilli could be detected. The largest of the cervical glands showed extensive caseation, while the smaller ones presented numerous small yellow caseous points. Microscopically numerous giant cell systems were observed in the glands. Nine months after the operation the boy was in the best of health and there was no trace of any glandular enlargement in the neck. The second case, a very similar one, was that of a girl, aged 11, with well marked adenoids and several enlarged glands in the deep cervical chain on both sides of the neck. A history of suppuration in connection with one of the glands on the left side was obtained and a scar bore evidence of the same. In the lymphoid tissue from the nasopharynx histologic appearances similar to those described in the first case were observed.

While these two cases illustrate tuberculous infection of the superior deep cervical glands, the following case is quoted in order to show that the infection may extend down the glandular chain and involve the supraclavicular glands. In this case, a young woman, aged 20, the primary infection took place through the faucial tonsil, which was an enlarged submerged gland, the nose and nasopharynx presenting a normal healthy appearance. On the left side of the neck three slightly enlarged glands could be palpated in the superior deep chain. Along the posterior edge of the sternomastoid muscle a chain of enlarged glands was visible, one gland in the middle of the chain being of some size. From the supraclavicular region a mass of caseous glands had been recently removed by the surgeon, who contemplated removal of those situated higher up after the tonsil had been enucleated. No evidence of pulmonary disease could be detected. Microscopic examination of the left tonsil furnished histologic evidence of tuberculous infection in the form of a few scattered giant cell areas.

Up to this point, therefore, no difficulty has been met with either experimentally or clinically in establishing the presence of tubercle bacilli in the nasal cavities and a direct continuity of infection from the mucous membrane through the cervical chain of glands. The difficulty in establishing the further route of infection experimentally on account of the possibility of inhalation or even ingestion of the bacilli has already been pointed out. Clinical evidence as to the mode of extension from the neck to the lungs and mediastinal glands presents greater difficulties, and even postmortem findings are not conclusive.

In connection with the lymph gland pathway in the pathogenesis of pulmonary tubercle, Beitzke[40] has made some interesting observations, based on postmortem examinations. He first points out that in children a descending tuberculosis of the cervical lymphatic glands is not uncommon. In thirty-five cases of pulmonary and bronchial gland tubercle the cervical glands were found tuberculous in twenty-two and free from tubercle in thirteen. In seventeen out of twenty-four cases of descending cervical gland tubercle there was at the same time pulmonary and bronchial gland tuberculosis, the disease in the latter organs being much farther advanced than in the cervical glands. In only four cases in the series it was possible that the lung affection was secondary to the cervical glandular disease. Beitzke, as a result of his postmortem researches, came to the following conclusions: As the pulmonary and bronchial gland affection is usually of longer standing and has made more progress than that in the cervical glands, the former have been infected by inhalation of the virus, while the latter have become infected either secondarily by inoculation with tuberculous sputum through the tonsils or independent of the lung disease but coexistent with it and from the same source. Further, that in the absence of any direct lymphatic connection between the cervical and bronchial glands, tuberculous infection of the lungs by way of the cervical glands can only take place through the large veins and the right side of the heart.

Albrecht, from a study of one thousand and sixty tuberculous children, has formulated the view that the primary site of infection is most often in the lung from inhalation. If there is also tuberculosis of the cervical lymphtic glands, it is secondary to the pulmonary affection, and it is either of an ascending nature, from the peribronchial glands upwards, or descending, from secondary infection of the pharynx through the sputum.

In looking at this subject, from its clinical aspect, we are further led to study the second proposition, namely, the infection of the apex of the lung by direct extension from the lowest of the deep cervical glands. Grober has expressed the opinion that when the supraclavicular glands have become affected there is an extension of the disease to the thoracic parietal lymphatic vessels. This is followed by an inflammatory exudation, with consequent involvement of the visceral pleura and apex of the lung. George B. Wood[41] has expressed the opinion that when the supraclavicular glands soften and a periadenitis takes place the neighboring pleural apex becomes infected by continuity of tissue. A similar view is held by Philip.[42] He suggests that an analogous condition is found in the passage of infective material from the liver into the lung. In connection with this method of pulmonary infection James Ritchie[42] has drawn attention to the possibility of the tubercle bacilli being drawn into the lung by a process of suction. If the respiratory pump fills the heart at every inspiration in consequence of the relief which is thereby given to the elasticity of the lung, why should there not be a similar suction process taking place from the lymphatics all around the lung? He is of opinion that the small tubercles frequently seen on the thoracic surface of the diaphragm in cases of tubercular peritonitis have resulted from the suction of the bacilli through the diaphragm. Consequently, he argues that a similar force may possibly play the same part in connection with apical infection from the deep cervical glands.

The thesis of Grober and Philip has been opposed by Most.[43] If adhesions form between the deep cervical glands and the apex of the pleura, it is natural to expect evidence of such an infiltrating process at postmortem examinations upon patients dying with pulmonary tuberculosis. Most has been unable to find evidence of the same at autopsies. In addition to this negative finding, Most draws attention to the fact that it is not common to find the cervical lymphatic glands enlarged in pulmonary tubercle. In a large number of postmorten examinations carried out in Breslau he was unable to find evidence of their enlargement, and Abrikissoff, who carried out a microscopic investigation of the glands, confirmed the views of Most as to the rarity of antecedent cervical gland tubercle. Our own observations on this point are entirely clinical, and are based upon the examination of a large number of cases of laryngeal tuberculosis secondary to pulmonary disease. In these cases of phthisis pulmonalis we have frequently commented upon the absence of cervical gland enlargement.

Reference has already been made to the occurrence of tuberculous disease of the nasal mucous membrane, and we have had an opportunity of observing it in fifty-six cases. The majority of these cases were classified as lupus, in which the destructive process is slow, and in which tubercle bacilli are found with difficulty. The disease which affects mainly the anterior part of the nasal cavity was often associated with a similar condition of the mucous membrane of the soft palate, fauces, and posterior pharyngeal wall, and in some cases with a similar condition in the larynx, especially of the upper aperture. Our object in referring to it at this point is for the purpose of drawing attention to the fact that the disease may exist for years in these situations without any general systemic infection taking place. Of the fifty-six cases investigated, we know only of two in which pulmonary tuberculosis developed. The ages of the patients varied from 7 to 56 years, and in many of them the disease had existed for a great number of years, varying from one to twenty years. We have been struck further in these cases with the absence of any marked enlargement of the cervical lymphatic glands, and with the general good health enjoyed by these patients. Thus in a patient 29 years of age the nose had been affected for twenty years, yet glandular enlargement was not observed. Although the disease affected the anterior part of the nasal septum and the vestibule, and consequently lay anteriorly to the main lymphatic drainage of the nasal mucous membrane, it must be borne in mind that the lymphatics from the anterior part of the nasal mucosa pass eventually into the deep cervical chain of glands by way of the lymphatic vessels of the face and the submaxillary glands. While many of these patients came under treatment, local recurrence of the disease occurred from time to time, and fresh areas of mucous membrane became affected. Nevertheless the inferior deep cervical glands did not become enlarged, nor did pulmonary tuberculosis manifest itself.

We have still to refer to the third proposition, namely, that the cervical glands directly infect the mediastinal glands, and that the bacilli then pass from the latter to the lungs by entering the blood stream in the pulmonary artery after adhesion of the glands to the vessel wall. As already shown, anatomic injections have failed to demonstrate any direct communication between the cervical and the bronchial glands. Aufrecht's work in connection with this subject cannot be lightly passed over, and therefore the possibility of this channel of infection must be considered.

Summary.—In summarizing the second part of our subject, the connection between the nasal and nasopharyngeal lymphatics and the rest of the body, as exemplified by the invasion of the tubercle bacillus, we are forced to the conclusion that further investigation and observation are still necessary. Certain anatomic and clinical facts, however, must be regarded as proved. The lymph drainage of the upper air passages passes through the cervical chain of glands and enters the large veins at the root of the neck; further, the tracheobronchial glands derive their afferent vessels from the mucous membrane of the lower respiratory passages and pulmonary alveoli, while their efferent vessels pass to the large veins at the root of the neck and enter the blood stream. No efferent vessels have been demonstrated between the deep cervical and the tracheobronchial glands.

Both experimentally and clinically it has been shown that tuberculous disease of the cervical lymphatic glands may be derived from infection of the nasal and nasopharyngeal mucosa by the tubercle bacillus. As to the manner in which the bacilli pass from the cervical glands to the lungs two explanations have been offered: first, by way of the deep efferent cervical lymph vessels discharging into the thoracic duct upon the left side of the neck, and on the right side through the right lymphatic duct into the large veins, thence by the right side of the heart and pulmonary artery to the lungs; secondly, by an extension of the inflammatory process from the diseased inferior deep cervical glands directly to the pleura and apex of the lung. Experimental evidence has been brought forward in support of the extension of the tuberculous disease by the first or anatomic pathway, but we have failed to bring forward pathologic postmortem data in support of direct extension from the cervical glands to the apex of the lung.

The fact that more than one portal of entry exists in the upper air passages increases the difficulty in estimating the actual part played by the nasal and nasopharyngeal lymphatics in distributing infection. Tubercle bacilli may be inhaled into the lungs and the cervical lymphatic glands may be secondarily infected by the bacilli in the sputum entering through the pharyngeal lymphoid tissue. Further, infection by inhalation may take place concurrently with infection of the cervical glands from the nasal mucosa derived from one and the same infective source. Again, the tubercle bacilli may pass through the mucous membrane of the upper air passages and the cervical glands without leaving any evident trace of their passage, consequently this pathway of infection may clinically pass unnoticed.

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LIX.

THE EAR AND SOCIAL HYGIENE.*

By Percy Fridenberg, M. D.,

New York.

One of the most striking signs of our times is the general tendency toward cooperation and correlation of activities, physical, mental, and social. This is reflected in our medical science and art, which is becoming, more and more, a part of communal rather than individual work. While the good physician, still as of yore, sees his main task and duty in the relief of suffering and the cure of disease, he is increasingly interested in and struggling with the broader problems of the health, wellbeing and physical and mental vigor of the community and of the generations to come. Not only treatment, prophylaxis and hygiene, but training, education, rational living, and the propaganda of health must be considered, today, as legitimate spheres of action for the physician.

The function of otology in this wide field is a varied one, and part of the ground, that relating to deafness, deafmutism and the reeducation by lip-reading, and so on, has been one of the most gratifying chapters in the history of modern pedagogics. The part which otologists have taken in this work is too well known to require more than a reference here. There are, however, other fields, which if less vitally important economically, are at least well worth considering from the point of view of social wellbeing, comfort, and ideal civilization. I am thinking of the modern environment and its possibilities, benign and beneficient, for the organ of hearing.

The social factors in the etiology of aural disease and injury, are well known. The industrial evils, the important prophylactic and hygienic axioms are common knowledge, at least to the specialistic professional. But one step still has to be taken, the transfer, as far as that is feasible and advisable, of this stock of knowledge to the community, its popularization, generalization, and the formation of a habit, tradition, and custom of good and pleasant conditions of hearing, and, indirectly, of speaking. This popularization of medical knowledge is the last and most important step in its practical application. The medical common sense of an age is the experimental science of its predecessor. In this respect there has been a notable advance in the last generation, and today our community is well informed on matters of current hygiene and has applied this knowledge practically in everyday life, in educational and social and legislative requirements.

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The organ of hearing has not been as well treated in this respect as the organ of sight. There is much more consideration for the eye than for the ear, and popular tradition as well as public opinion has been crystalized into a recognition of the importance of favorable hygienic conditions for the preservation of sight and the danger of impairment of vision. The reason for this is, at least partially, no doubt the fact that loss of sight was an obvious and visible loss, and this of course appealed to our age. Again, the loss of sight renders the individual helpless, puts him under the necessity, almost always, of having an attendant, and thus places two persons, in many cases, hors du combat economically. The misfortune and the disadvantage of loss of hearing is less obvious, serious, and pathetic, but scarcely less important. We have not yet realized the necessity of aural comfort and all this implies in omission and commission. The eye has "come into its own," and the community recognizes this in its regulation of illumination, decoration of buildings, legibility of type, and so on. The eye can no longer be insulted, with impunity, by excessive illumination or used abnormally without calling forth a protest from those who know, and today the "man in the street" is one who knows. Our ears, however, have no sanctuary from excessive noise, and there is not even a general recognition of the need of a haven of refuge, an understanding of the meaning of ear strain. We are beginning to reap the fruit of persistent effort in the general recognition by the laity of the dependence of hearing and sound ears, largely on normal upper respiratory tracts, and of these again largely on normal and sufficient breathing.

The influence on mentality of hearing and of its defects is well known. It is remarkable what a marked influence on spirituality and the social psyche even slight deafness has, and the totally deaf instinctively and unconsciously and automatically exclude themselves from social relations and active intercourse with the world. Blindness has no such sequelæ. It has occurred to me that this is foreshadowed and indicated in the phylogenesis of the organ of hearing, which from the earliest stages has been most intimately connected with the cerebrum and has served to mediate a specialized sensation, that of sound or at least of sound vibration. The original rudimentary eye, on the other hand, was merely a patch of intensified and spatially concentrated heat and touch sense, a spot on the skin with extra development which was rather more acutely sensitive than the rest of the body covering.

The significance of hearing for the safety of the organism is marked in even lower forms of animal life. Long before the eye has been developed sufficiently to be of practical service, actual sound waves or vibrations without specific tonal character are able to produce a specific sensation and thus to give a warning to the organism possessed of even a rudimentary ear or otic vesicle. It is noteworthy that the progressive development of the organ of hearing goes hand in hand with the evolution of the sense of balance and rhythm, and with terminal sensory organs reacting to the specific stimuli of motion and gravity. Articulate speech is formed under the control of this double function of sound perception and rhythm which latter for our purposes may be looked upon as the unconscious or automatic recognition of the time element in motion. While the importance of hearing, sensu strictiori, in the development of normal speech is generally recognized, I do not think that sufficient attention has been paid to the significance of rhythm and sense of time, which are undoubtedly concepts or psychic reactions of auditory origin. Rhythmic tone vibrations have a decided and powerful effect on innervational states, both as stimuli and as inhibition, and directly influence such basic muscular processes as respiration and heart action. Indirectly and through the mediation of breath and pulse rate, energy, volition, and finally emotion itself are affected. It is generally accepted that such varying musical influences as a dirge, a military march, a dance tune, produce their characteristic effect, independent of intellectual processes and concepts, by labyrinthine stimulation. It stands to reason that this basic and elemental reaction may be reenforced in various ways and most diversely by the psychic processes to which it gives rise and may then appear as a germ of emotion, idea, or conscious volition. The sense of time and of time measure,—what the Germans call "Zeit-mass" to distinguish it from the abstract and pervading continuity which, like tide, "waits for no man"—is of aural origin, and while space concepts and those of space measure or size and dimension are basically visual, there is no doubt that they are largely influenced by, and that their accuracy depends mainly on, number concepts of a fundamentally aural origin. The aural coefficient or factor in the mechanism of speech has been referred to. I believe that there is a similar relation to written or pictured language and to the formation of the alphabet. Briefly stated, my theory is that the specific sounds of letters (or possibly, at first, of characteristic syllables or monosyllabic words) were produced as a result of, one might almost say, in the course of descriptive and illustrative mouth and lip positions, which latter themselves had a specific meaning when interpreted by vision. The sound itself had, originally, no significance for understanding whatsoever, but was, one might say, a byproduct. This invariable accompaniment, however, had its value and an even more wide application than the visual component, as, for instance, in darkness or at a distance, and in the course of time the invariable sound-accompaniment of the mouth position was taken at its face valuation for the symbol and, indirectly, the equivalent of the letter, sound, or syllable. In the reeducation of the deafmute by lip reading, it seems to me, we are retracing this old, old road on which prehistoric man traveled in forming his speech and language. Speech brings up the topic of diction and enunciation, and the value of a good ear and a voice which does not offend. A pleasant voice is almost as important, socially and economically, as a sense of melody and pitch and rhythm, and given the anatomic requisite of normal sound producing organs, the good ear will almost invariably be found to be associated with a good voice. To preserve and develop normal hearing and speech, to prevent aural disease, inferiority or abuse, is the aim of conservative otology.

The bearing of a normal upper air passage and the deleterious influence of abnormalities of nose and nasopharynx is an old story, merely touched on, en passant. There are other factors of modern life which tend to injure the ear and hearing, such as unnecessary noises and the din of traffic which blunt the hearing and, more important, cause a loud, shrieking voice. Dusty, gasoline filled atmosphere, causing chronic nasopharyngeal affections. Lack of respect for organ of speech and hearing, and no insistence on agreeable modulation or low, soft voice in children. Defective teachers and teaching. We are gradually recognizing the economic importance of vision and indirectly of adequate and proper illumination in factories, schools, tenements, but hearing is still left to its own devices. There is need of a crusade against unnecessary noise and of a campaign for fair speech. I shall merely mention the industrial aspect of aurally dangerous trades, sports, and habits; the influence on hearing of environment, altitude, and barometric pressure, of inheritance and hardness of hearing, syphilis and the ear, tuberculosis, and the diseases of childhood which so often lead to grave affections of the ear and jeopardize not only audition but life itself.

LX.

THE RELATION OF AGE TO TONSILLAR INFECTION.*

By Harry A. Barnes, M. D.,

Boston.

In the following paper I have attempted to explain, on purely histologic grounds, the reasons that the tonsil of the infant under one year of age and the tonsil of the adult give rise to fewer infections relatively than the tonsil of childhood. In doing this I have dwelt largely upon the changes of lymphoid activity with age and their effect upon the histologic structure of the crypt.

The crypts of the tonsil are developed as invaginations of faucial epithelium which push their way into the mesoderm in the form of solid buds and are transformed into crypts by a separation and cornification of their central cells which form a core and are expelled into the faucial cavity. The first of these buds begins to be developed about the fourth month of fetal life; but new buds continue to be formed, not only during the remainder of the fetal life, but throughout the first year of infancy. Up to the end of this period, then, we find crypts in all stages of development—solid epithelial buds in which no line of demarkation between the central and outer cells is seen; buds in which the central core has been formed but not expelled; and lastly fully developed crypts.

The above change in the cryptic epithelium is intrinsic in character. Another change, of an extrinsic nature, begins to take place shortly after birth, and is due entirely to the action of lymphoid cells upon the epithelium. At birth the lymphoid tissue of the tonsil is small in amount and not specially active. No follicles are present. A few lymphocytes may be seen wandering through the epithelium of the crypts, which at this

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***Candidate's thesis for admission to the American Laryngological, Rhinological and Otological Society.**

time is much like the surface epithelium, i. e., it is of the stratified squamous variety, many layers in thickness, compact, and with a perfectly definite basal outline, unbroken by the surrounding lymphoid tissue. At about the fourth month of infancy the lymphoid follicles with their germinal centers begin to show distinctly; vast numbers of lymphocytes are produced, and a correspondingly large number of them find their way into the cryptic epithelium and profoundly modify its character. First the basal outline of the epithelium becomes obscured, and it is difficult to tell where the lymphoid tissue ends and the epithelium begins. Masses of lymphocytes press outward toward the cryptic cavity, and separate the lower layers of epithelial cells from each other, so that they appear as more or less isolated epithelial fingers extending from the surface of the crypt into the lymphoid tissue. (Figure 6.) In places these fingers disappear altogether, being either absorbed by pressure of lymphoid cells, or masked by the large numbers of them. As an end result of this process, we have left only a very thin film of intact epithelium, two or three cells in thickness, lining the cryptic cavity. (Figures 2, 3, 4, 5, and 6.)

This action of the lymphoid cells upon the epithelium of the crypts seems not to be due to any inherent power of motion of the lymphocytes, though they possess that power to a limited degree, but purely to the pressure of numbers. The surface epithelium remains practically unaltered by this pressure, as it is able to expand outward; consequently it is almost always found intact. But the epithelium of the crypt, caught between more or less pressure on all sides, suffers as described above.

At just what age this epithelial degeneration reaches its maximum it is impossible to say, though after the first year and a half of life it is usually well advanced. Throughout childhood it remains essentially the same. At an uncertain age, which we may arbitrarily place at puberty, a general decrease in activity occurs in the lymphoid tissues of the fauces and pharynx. With this decreased activity in the tonsil a certain amount of regeneration of the cryptic epithelium takes place. As the lymphoid follicles with their germinal centers become less numerous and less active, the number of lymphocytes is correspondingly reduced, and pressure on the crypts is lessened; the isolated fragments of epithelium are allowed to fall together and a somewhat irregular thickening takes place. It is almost never uniform, however, and in places often does not occur at all. But the average unhypertrophied tonsil of the adult has a cryptic epithelium which nearly approaches the infantile or surface type. (Figure 7.)

Turning now to the clinical bearing of these facts, we may consider what the chances of infection may be in each of the types of tonsil described. It must be borne in mind that the tonsil does not always correspond in type with the age of the individual. Many tonsils of the adult have all the characteristics of the tonsil of childhood, and sometimes the infant tonsil shows a precocious development which places it in the childhood group. The histologic structure of the average tonsil, however, corresponds to the age of the individual.

Those cellular or chemical forces of immunity which go under the general name of individual resistance will be disregarded here. Important as they are in deciding the question of infection or noninfection, they act quite independent of structural conditions.

The tonsil of the infant of one year and under seems to offer little chance for infection. The immature crypts, either in the form of solid buds, or with the central core formed but not expelled, are practically impervious to bacteria. The fully formed crypts with their intact epithelium would seem to be almost equally so. Even with a vulnerable epithelium, infection would not be likely to occur, as the amount of cryptic débris at this age is small, and in consequence bacteria are probably comparatively few in number. The reason for this slight amount of débris in the crypts, may be that the number of lymphocytes passing through the epithelium, which cells make up the greater part of the cheesy masses found in the tonsillar crypts of childhood, is small; that cryptic débris is not likely to be retained for any length of time, since the pressure on the cryptic walls due to lymphoid activity is slight, and in consequence good drainage is the rule.

In the tonsil of childhood we find a condition which, if it had been specially devised for the purpose of creating infections, could hardly be improved. With the great increase of lymphoid activity after the first year of life, the pressure on the walls of the crypts must be considerable; it is likely, also, that it is not uniform but greatest opposite the follicles. The result is that drainage becomes imperfect, retention of cellular débris follows, irregular dilatation of the crypts occurs, and pockets are formed by the backing up of the cryptic contents, which decompose and make perfect nesting places for bacteria of all sorts which may enter from the faucial cavity. Add to this the feeble and degenerated structure of the cryptic epithelium at this age, and the wonder is, not that infection occurs often, but that any tonsils escape it.

The tonsil of the adult is a very uncertain quantity, both as regards its structure and its proneness to infection. Often it cannot be distinguished from the tonsil of childhood, in which case it is as open to infection as the latter; indeed, it may more properly be looked upon as a young tonsil persisting in the adult, than as an adult tonsil. The average tonsil of the adult, however, has undergone to a more or less marked degree those changes in lymphoid tissue and epithelium already described. Cryptic retention is rendered less likely, in part by the diminished pressure of lymphoid tissue on the sides of the crypts and their consequent better drainage; in part also to the decrease in the number of lymphocytes which find their way into the cryptic cavities and are retained as débris. The thickening of the epithelial lining of the crypts, spite of its lack of uniformity, probably exercises a marked influence in preventing the passage of bacteria into the deeper tissues.

213 Beacon Street.

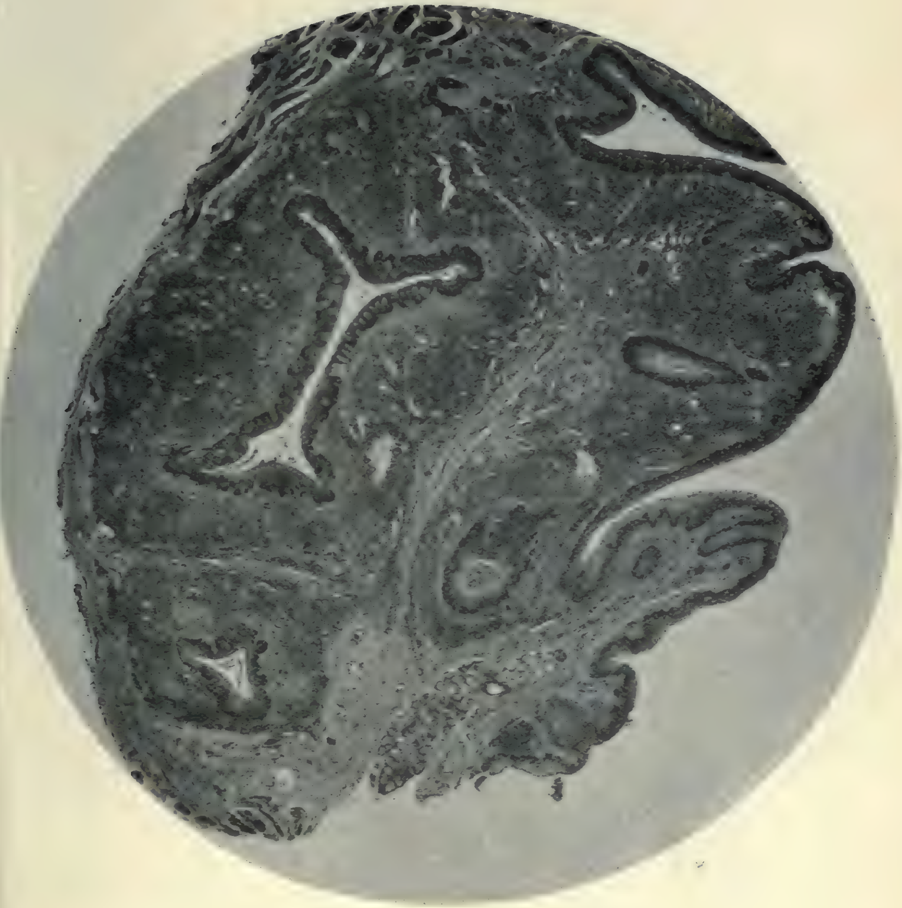

FIGURE I.

Tonsil of infant, age six months. (X 15.) Lymphoid tissue diffuse, with only slight suggestion of follicle formation near lower crypt on left. Cryptic epithelium intact. The two crypts on the right are still in the developmental stage, having central cores formed but not expelled.

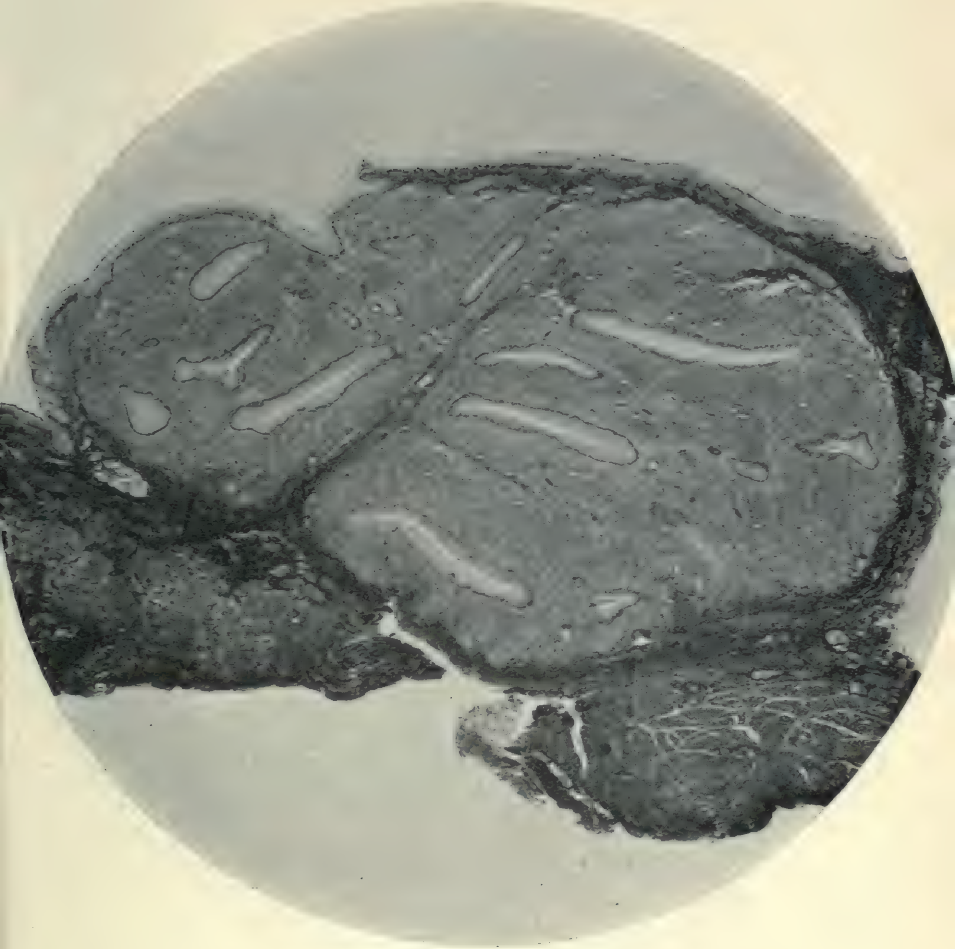

FIGURE II.

Tonsil of infant, age eleven months. (X 12½.) Lymphoid tissue beginning to show activity. Follicles with germinal centers are fairly numerous, though they do not show as distinctly as in older tonsils. Crypts are in all stages of development. Cryptic epithelium for the most part intact. The two large crypts in the upper right quadrant show marked degeneration of the epithelium.

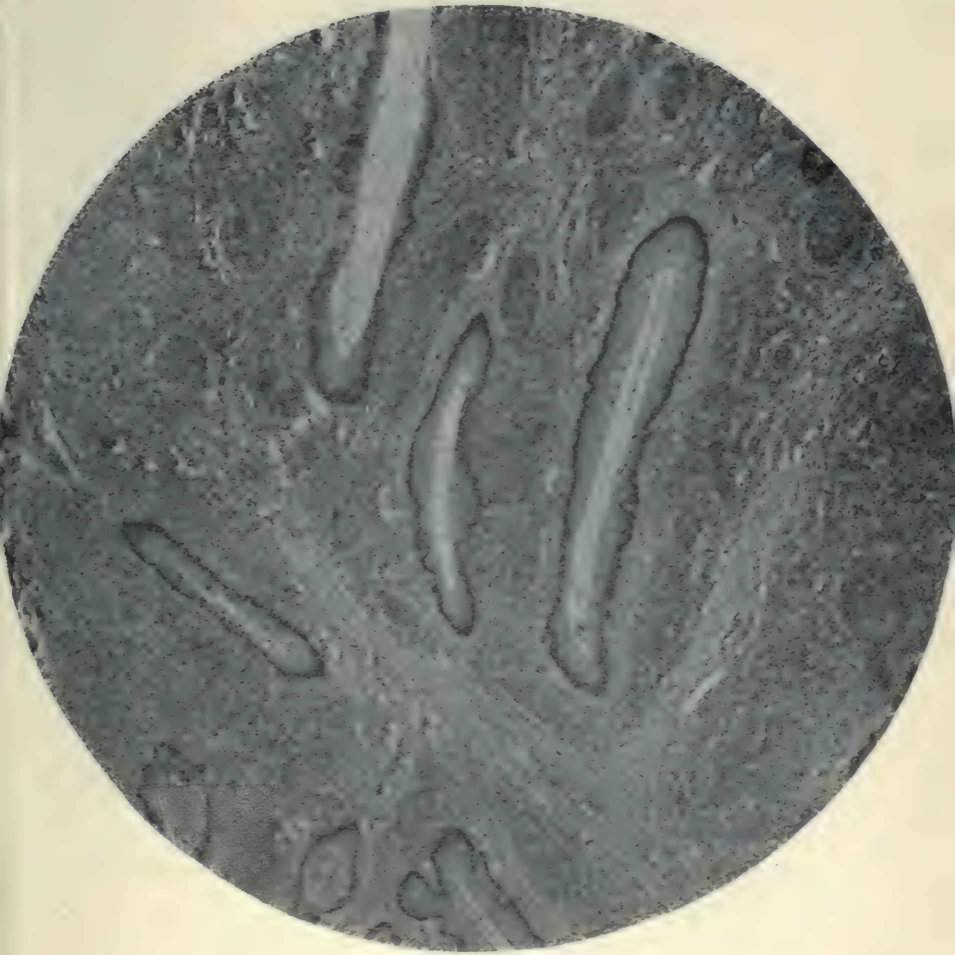

FIGURE III.

Field from Figure II. (X 29 1/6.) Shows follicle formation and degenerative changes in the epithelium.

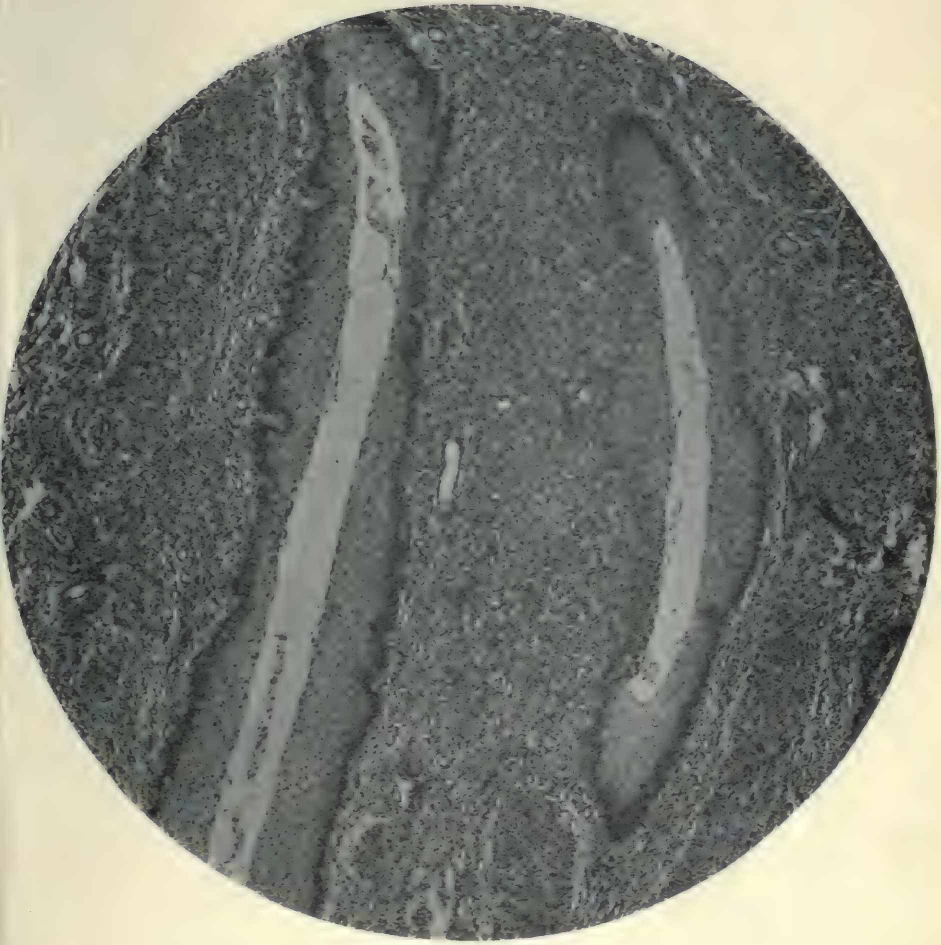

FIGURE IV.

Field from Figure II. (X 66 2/3.) Epithelium of crypt on left nearly intact. The crypt on the right shows extensive epithelial degeneration.

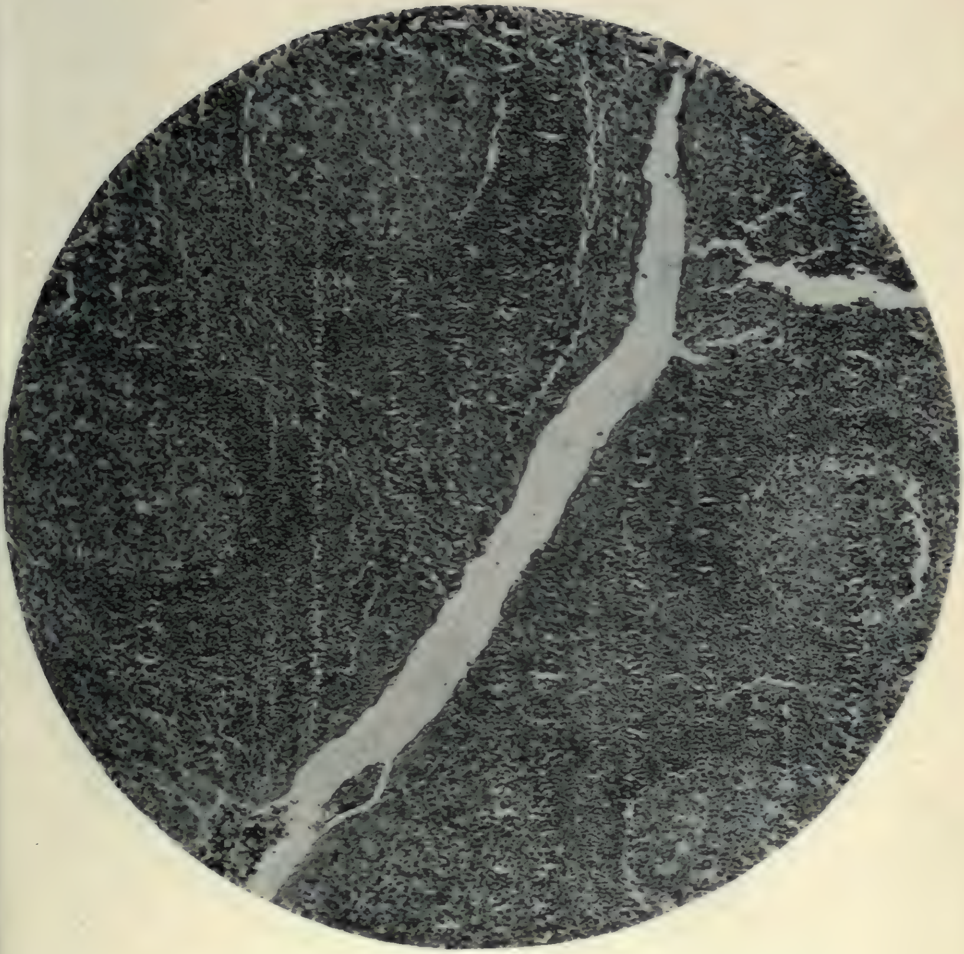

FIGURE V.

Tonsil of child, age six years. (X 66 2/3.) This section is typical of the tonsil of childhood. Lymphoid tissue very active. Follicles with germinal centers numerous and distinct. Cryptic epithelium reduced to a film; though in places it may be seen extending somewhat deeper below the surface, as shown in Figure VI.

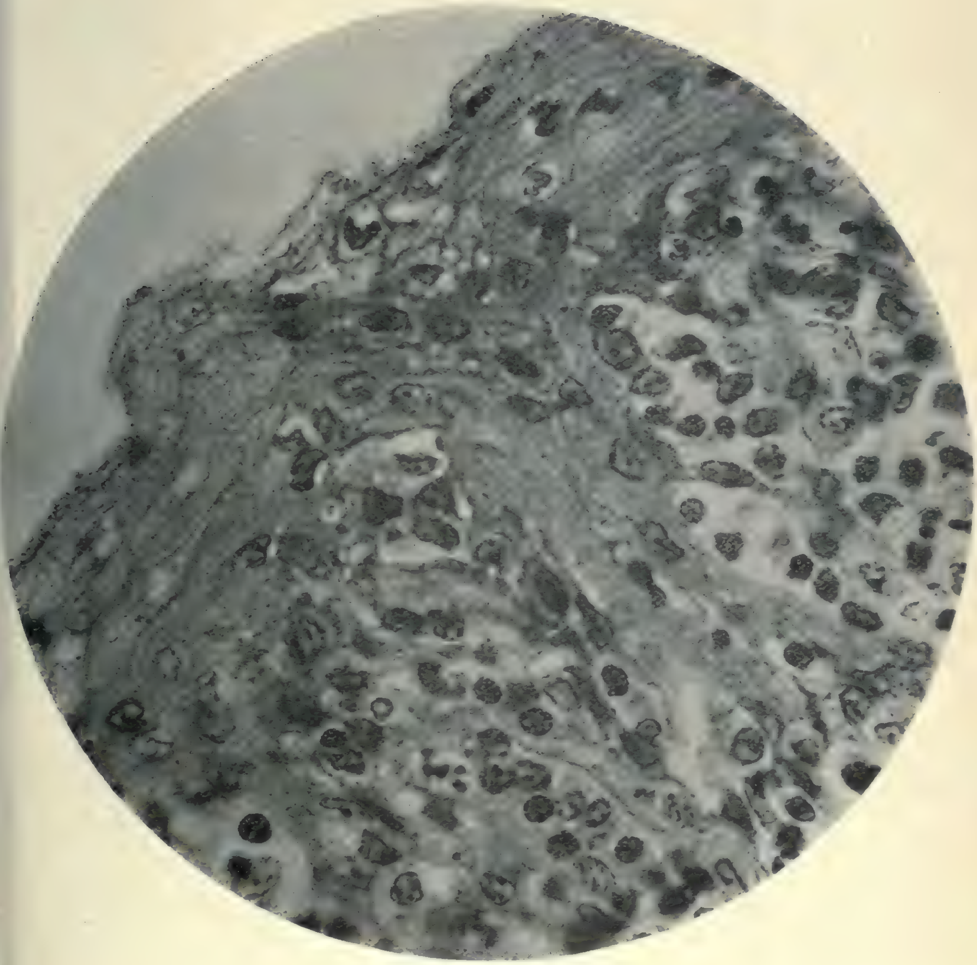

FIGURE VI.

A portion of the epithelium of the crypt shown in Figure V. (X 566 2/3.) Shows the ragged fingers of epithelium extending below the surface into the lymphoid tissue.

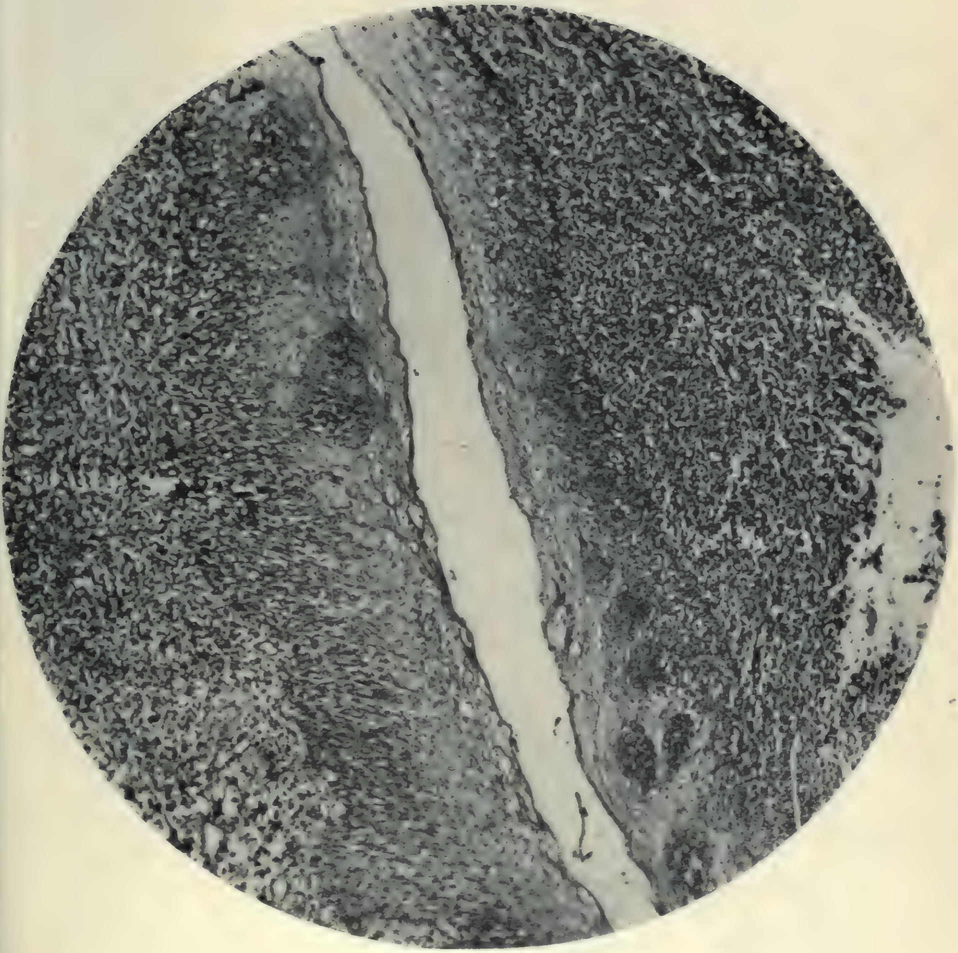

FIGURE VII.

Typical field from regressive tonsil of the adult. (X 66 2/3.) Lymphoid tissue inactive. Cryptic epithelium fairly uniformly thick.

LXI.

CARTILAGINOUS TUMORS OF THE LARYNX.

By James J. Carroll, A. M., M. D.,

Baltimore.

On the first day of April, 1834, a pale, emaciated laborer, 38 years old, was received in the medical department of the Charité in Berlin. He had been suffering for a long time with cough and expectoration, was unconscious upon admittance to the hospital, and died an hour after his arrival. At the autopsy the following morning it was found that the primary cause of death was a cartilaginous growth, the size of a walnut, filling the cavity of the larynx. This case was reported by Prof. Froriep in the *Medizinische Zeitung*, September 17, 1834.[1] It was abstracted the following year in the *Jahrbücher der In-und Ausländischen Gesammten Medizin*,[2] and also in the *Dublin Journal of Medical and Chemical Science*.[3] In 1837 it was cited by Ryland in a treatise on the Diseases and Injuries of the Larynx and Trachea.[4] Froriep's case has generally been regarded as the first authentic observation of cartilaginous tumor of the larynx, although Macilwain published in the *Edinburgh Medical and Surgical Journal* of 1831[5] a case of a woman, between 50 and 60 years of age, dying from suffocation, whose larynx at autopsy contained a growth strongly resembling a cartilaginous tumor.

In these two instances the true condition was discovered only after death. It is easily intelligible that the diagnosis of internal laryngeal tumors was well-nigh impossible before the use of the laryngoscope. After its discovery by Garcia and its introduction into practice by Türch and Czermak in 1858 and 1859, the number of diagnosticated tumors of the larynx increased rapidly, so that in 1889 Semon was able to collect from various sources 10,747 benign tumors of the larynx. How many of these were cartilaginous is not stated, but we may be sure, judging from subsequent complications, they were very few.

In the early part of 1900 Alexander published in the *Archiv für Laryngologie*[6] a most exhaustive and very authoritative treatise on cartilaginous tumors of the larynx. He reviewed most carefully the previous literature upon the subject, and together with his own cited 26 cases. So thorough was Alexander's work, that it seemed superfluous on my part to go over the ground covered by him. Consequently I have confined myself to publications since Alexander's article, and my search through English, German, and French literature was rewarded by finding the following cases:

1. Witte[7] in 1900 published in the *Archiv für Laryngologie* two cases of ecchondrosis of the arytenoid, which he accidentally came upon in the University Ear and Throat Clinic of Rostock. The first was a man of 45 years, who had upon the anterior side of each arytenoid a small, round growth, measuring about 6 mm. long for the right and about 4 mm. long for the left. The tumors caused absolutely no symptoms and were unchanged in size after five years of observation.

2. Witte's second case was a man 34 years old, who had a small round, hard tumor on the inner side of the left arytenoid, about 4 mm. long and covered with normal mucous membrane. The patient suffered no inconvenience from the growth and no treatment was given.

3. In the 81st volume of the *Annales de la société de médicine de Gand,* P. van Eeckhaute[8] reported a case of enchondroma of the larynx in a man 35 years old, who had suffered with hoarseness and cough for six months following influenza. Hoarseness gradually gave way to aphonia. Patient's larynx was slightly painful. Under the right cord anteriorly was a tumor, size of a pea, growing from the cricoid. The growth was attached by a slender pedicle, immobile and looked like a small cyst. Several attempts at removal with snare were unsuccessful. It was finally removed piece by piece with cutting forceps by the endolaryngeal route. Patient recovered with restoration of normal voice. No histologic examination of the tumor was made.

4. March 18, 1904, Börger[9] presented to the Laryngologische Gesellschaft of Berlin a man, 59 years of age, who was suffering with dyspnea. He had been hoarse for two years and had difficult and painful deglutition for five years. Laryngoscopic examination showed a large, hard subglottic

tumor, which hid the entrance to the trachea except for a small space anteriorly. Diagnosis of chondroma was made. Total extirpation of the larynx was performed by v. Bergmann, March 23, 1904, and on the following day Prof. Fränkel exhibited the specimen before the Berliner medizinsche Gesellschaft, which showed that the plate of the cricoid had been perforated by the tumor. After the operation patient did well for ten days. He suddenly collapsed on the eleventh day and died on the twelfth. The chief findings at autopsy were a fresh purulent peritonitis and a beginning hemorrhagic nephritis.

5. In the *Berliner klinische Wochenschrift* for 1906, Alexander[10] reported a case of enchondroma of the larynx in a man 53 years old, who had for three months on the right side of the thyroid cartilage exteriorly a round mass, the size of a small apple, which though generally hard was soft in places and painful on pressure. Nothing abnormal was seen in the larynx by the laryngoscope. As the patient had no trouble with breathing and no hoarseness, the author tried Roentgen rays temporarily, though he expected an extirpation of the larynx to be done eventually. Slight reduction in the size of the tumor was noticed after fourteen days of treatment.

6. In the 54th volume of the *Münch. med. Wochensch.*, Hartleib[11] published a case of enchondroma of the larynx in a man 45 years old, who had had increasing dyspnea for several months. Laryngoscope showed a large tumor with broad base on the left and posterior walls of the larynx attached to the thyroid cartilage and overhanging the cricoid. Tumor was hard, smooth, covered with normal mucous membrane and filled nearly the entire larynx. Its removal was accomplished by approaching it exteriorly on the side, freeing the larynx well from surrounding structures, then shelling the mass out with a curette submucously without entering the cavity of the larynx. Patient recovered, but with a posticus paralysis on account of which a certain amount of dyspnea continued. Microscopic examination of the neoplasm confirmed the clinical diagnosis.

7. Landwehrmann[12] in the 59th volume of the *Zeitschrift für Ohrenheilkunde* reported a case of ecchondrosis of the arytenoid in a woman 28 years old who had been hoarse for two years. A small hard growth was found on the right cord

posteriorly. A paralysis of the internus was present. Tumor was removed with double curette and found by the microscope to consist of cartilage. Patient recovered with improvement of the voice but not clear speech. Paralysis of the internus remained unchanged.

8. In 1909 Don Mansfield[13] published a very instructive article on cartilaginous tumors of the larynx in the *Archiv für Laryngologie*. Besides referring to eight cases found in literature since 1900, the author described in detail a case of myxomatous chondroma of the larynx which came under his observation. Patient was a healthy man of 50 years, who had difficult breathing for two years, slight pain upon swallowing, and hoarseness. Laryngoscopic examination showed a narrowing of the glottis, swelling of the subglottic mucous membrane, especially posteriorly, and an irregular mass occupying the posterior wall and sides of the larynx. The neoplasm grew from the cricoid cartilage and was somewhat lobulated, some of the lobules being hard, others soft. Its removal was effected by an extensive external operation. When the tumor was curetted away the plate of the cricoid was found perforated down to the muscular wall of the esophagus. Shortly after recovering from the anesthetic, patient complained of severe pain in the chest and died about twenty hours after the operation.

9. In the *Journal de Médicine de Bordeaux* of January, 1910, Moure and Daure[14] published a case of enchondroma of the larynx in a healthy man 62 years old who had noticed an alteration of the voice for six years, hoarseness for two and one-half years, and dyspnea for two years. There was a hard, globular swelling on the left side of the larynx externally. Laryngoscope showed a smooth, round tumor about the size of a mandarin, hiding the greater part of the laryngeal cavity and extending up into the pharynx. Preceded by tracheotomy, operation of thyrotomy together with incision of the thyrohyoid membrane was done under cocain. Tumor grew from the posterior surface of the cricoid and was removed with scissors. As it was too large to escape by the external wound, it was forced into the mouth and expelled by the patient. Recovery followed, but the ultimate effect upon the voice and respiration was not given. Histologic examination confirmed the diagnosis.

To the foregoing I would like to record a similar case which came under my observation in October, 1907, and which has not been previously published.

L. J. T., white, single, 34 years old, a railroad engineer, had always enjoyed good health until he contracted lues in 1904 and had both primary and secondary lesions. Patient took antisyphilitic treatment for a year, after which he stopped the medicine because he was free from symptoms. Four months before coming under observation patient began to get hoarse, the hoarseness gradually giving way to aphonia. About a month after the hoarseness came on he began to have some difficulty in breathing, and two months later he noticed an enlargement of his throat in the region of the larynx. He came to St. Joseph's Hospital, October 26, 1907, to find out the cause of his hoarseness. Examination showed the patient to be in excellent physical condition, all organs normal except the larynx. He was aphonic and had some difficulty in breathing, which was aggravated by the recumbent position and by walking. He had a short, quick, metallic cough, which was made worse by lying down. There was no difficulty nor pain upon swallowing. Exteriorly there was a swelling over the thyroid cartilage on the left side. No glandular enlargements were felt in the neck. Laryngoscope showed a large rose colored subglottic tumor. Its surface was even, smooth, clean, and free from ulceration. It lay just under the vocal cords, attached loosely to the under surface of the posterior half of the right cord and firmly connected with the posterior two-thirds of the left cord. The apex was free, rounded, and came within 5 or 6 mm. of touching the anterior wall below the commissure. The base was attached to the posterior wall and to a slight degree to the lateral walls. The right cord was congested and moved pretty freely but not entirely to the middle line. The anterior third of the left cord was free from congestion but the cord itself was fixed to the side of the larynx. The right arytenoid moved freely on attempt at phonation, but the left had only a slight motion, of a rotary character, with no approximation to the median line. There was a little thin mucus about the laryngeal cavity but no mucopurulent secretion. A few drops of cocain and adrenalin, injected into the larynx, made no change in size or contour of the tumor. A radiograph taken by Dr. H. Ashbury showed very clearly a more or less circular shadow, the upper boundary of which was about on a level with the middle horizontal plane of the thyroid cartilage, and the lower boundary fell a little below the ring of the cricoid. The anterior border was free, while posteriorly the shadow of the tumor was continuous with the shadow of the cricoid plate.

As the patient had had syphilis, he was put on antiluetic treatment for a month, although the larynx did not present a picture which in any way resembled the usual syphilitic lesions of the larynx. The growth was also not malignant in appearance. Of the benign tumors it suggested most strongly a chondroma or an internal struma. A positive diagnosis between these two was not ventured without a histologic examination. The patient was exhibited before the Rhino-Laryngological Section of the Baltimore City Medical Society, November 29, 1907.

The large size of the tumor and its position below the cords precluded the possibility of removing it by an endolaryngeal operation, the external operation was therefore decided upon. A preliminary tracheotomy through the third ring was done on December 11, 1907. On the 14th laryngofissure was performed by the late Dr. I. R. Trimble, with the patient under chloroform. A vertical incision was made in the skin in the median line from the hyoid bone to the second ring of the trachea where it joined the tracheotomy wound. After the thyroid cartilage, the cricothyroid membrane, and the cricoid cartilage were well exposed, a vertical section was made through the last two, exposing the lower part of the tumor. The growth filled almost the entire subglottic space, leaving only enough room between the apex of the tumor and the anterior commissure to pass a grooved director. The lower surface of the growth was smooth, pale red, slightly irregular and free from ulceration. To expose the mass satisfactorily the section had to be extended upwards through the entire thyroid cartilage, which was exceedingly hard to cut. With the sides of the thyroid cartilage pulled apart, ample room was obtained for manipulation. Laryngeal reflexes were abolished by cocain and the bleeding checked by adrenalin. Tumor was quite firm to the touch. Its free border faced anteriorly and to the right, the attachment being posteriorly and along the left wall of the larynx. The enveloping membrane, largely mucous membrane, was opened at the apex. A grayish white granular material oozed through this opening, not unlike boiled grits in appearance and consistency. The bulk of the tumor was removed with curette and most of the enveloping membrane with scalpel. After the use of the curette the plate of the cricoid was seen denuded of mucous membrane and perichondrium. The exact site of the growth was the left half of the cricoid plate, the posterior half of the cricothyroid membrane, and the adjacent thyroid cartilage. The origin was evidently from the cricoid, the thyroid being affected by extension. The tumor was as large as a medium sized English walnut, measuring about an inch in both vertical and horizontal diameters. Its upper surface under the cords was more flattened than the lower facing the trachea. In closing the wound the sides of the thyroid cartilage were brought together with silver wire. The cricoid ring was not sutured and the tracheotomy tube was brought up from the tracheotomy wound and inserted here, the original wound in the trachea being allowed to close. The tube caused a good deal of pain and cough and was removed on the second day after the operation. Wound was firmly healed on the twentieth day. Patient recovered with a much improved voice, good easy breathing, and no cough. Perfect vocal function could not be expected on account of the unavoidable destruction of a good part of the left cord. At this writing there is no evidence of recurrence. A histologic examination of the tumor was made by Dr. E. H. Hayward, whose report is as follows:

"The specimen consists of several small fragments of tissue, pink in color and of the consistency of muscle. There is no evidence of any old calcareous deposits on cutting the prepared specimen. Histologically there is seen a groundwork of material similar in structure to hyaline cartilage. Scattered throughout this are irregular nests of cartilage cells, many spindle shaped fibrous tissue cells, areas of myxomatous degeneration with fairly numerous stellate cells, and some small calcareous deposits. The most numerous and characteristic elements are the cartilage cells. They are rather atypical and show no regularity in arrangement. They are collected in scattered masses, separated by immature fibrous tissue and by elements of degeneration. Many of the cells are without capsules."

In an analysis of the foregoing cases, we are struck with the following points: In the first place, it is noteworthy how often this type of laryngeal tumor occurred in the male, nine out of ten cases being in men. In regard to age, the youngest patient was 28 years and the oldest, 62. Between 21 and 30 years inclusively there was one case; between 31 and 40, three cases; between 41 and 50, four cases; between 51 and 60, one case; between 61 and 70, one case. The average age was 43. The tumor had its origin in the cricoid five times, in the thyroid, twice, and in the arytenoid, three times. In two instances the plate of the cricoid was perforated by the growth. Although any part of the cartilaginous framework may be affected, a decided preference is shown for the cricoid. Only in one instance was the affection multiple, case No. 1 having a growth on each arytenoid. The tumor in every instance was of slow growth. In one case, No. 5, the swelling was situated entirely on the outside of the larynx. In two, No. 9 and No. 10, swelling was noticed externally as well as internally, and in seven cases there was no enlargement externally. The tumor varied in size from a pea to a mandarin. It was generally found hard, in only one instance were there areas of degenerative softening palpable. It was covered with pale red mucous membrane, which was normal throughout the laryngeal cavity except in one case, where it was described as thickened and swollen. In no instance was the mucous membrane ulcerated. The movements of the cords were unhampered in three cases, while in the other seven there was more or less curtailment of the normal action. Paralysis of the internus was present in one instance. The chief symptoms were alteration of the voice, gradually developing hoarseness, aphonia, embarrassed breathing, attacks of suffocation, difficult deglutition. Cough and pain were present in two cases. In two out of the ten cases there were absolutely no symptoms at all. General health of patients was not affected. In regard to treatment, in two instances there was none. Roentgen rays were tried in one case. The internal or endolaryngeal method of operating was followed in two cases. In one the double curette was used, in the other the cutting forceps. In five instances the external operation was performed, total extirpation of the larynx once, shelling out growth submucously once, and laryngofissure three times.

The results of the seven operations were as follows: Of the two operated by the internal method, both recovered, one with restoration of the voice, one with hoarseness. Of the five cases operated upon by the external method, two died and three recovered. Of the recoveries, one had a posticus paralysis with some dyspnea, another hoarseness, and the ultimate effect on the voice in the third case was not stated. Histologic examinations were made in five of the operated cases.

According to Virchow[15] a cartilaginous tumor is called by the generic term chondroma, and is divided into ecchondrosis and enchondroma. The former is a homogeneous mass growing from preexisting cartilage,the latter, a heterogeneous mass springing either from a noncartilaginous matrix or from cartilage which does not normally belong where the neoplasm starts. Virchow's definition is practically the same as held by pathologists today. Applying it to laryngeal tumors we see that an enchondroma of the larynx is a misnomer, and the term should be discarded because cartilaginous tumors of the larynx grow from preexisting cartilage. In regard to the term ecchondrosis, it is the opinion of many pathologists that this name should be reserved for those small overgrowths occurring in cartilage, which are not real tumors any more than exostoses are real tumors. Ecchondroses occur in the larynx. The two cases reported by Witte, the one by van Eeckhaute, and the one by Landwehrmann probably come under this class, and strictly speaking, are not genuine neoplasms. In addition to these pseudotumors there are three distinct kinds of cartilaginous growth in the larynx. The first grows to a considerable size out from cartilage without materially affecting the matrix from which it grows. To this the term ecchondroma, met with in Ribbert's[16] work on tumors, seems particularly fitting. As examples of ecchondroma may be mentioned three cases of our series, namely, Hartleib's, Moure and Daure's, and Carroll's. The second kind of tumor grows from cartilage and invades to a considerable extent the mother substance. Alexander suggested to call such tumors of the larynx chondroma, and many writers have followed his suggestion. As examples of laryngeal chondroma may be mentioned the cases reported by Börger and by Alexander. The third class is that of mixed tumor, in which some other tissue than cartilage develops independently in the tumor mass. The case reported by Don Mansfield may be taken as a good example of this.

In the fourth edition of Moritz Schmidt's[17] Krankheiten der oberen Luftwege, chondroma of the larynx is classed among malignant tumors. Although it has been known to recur and even to metastasize, it is not regarded by pathologists as malignant in the sense of being an invading tumor and is still generally looked upon by them as benign.

The etiology of chondroma of the larynx still remains in doubt. That a previous inflammation of the laryngeal mucosa has any causative connection with a subsequently developing tumor in the cartilaginous framework of the larynx is extremely doubtful. Nor have we sufficient evidence to believe that traumatism, syphilis, or tuberculosis has any direct bearing upon the occurrence of this neoplasm. In only one case of our compilation was there a history of previous syphilitic infection. It is rather striking how frequent cartilaginous tumors of the larynx occur in the male and how seldom in the female. It is also noteworthy that the time of life, at which most of these tumors occur, is between 40 and 50. According to Schoetz[18] ossification of the larynx occurs oftener in men than in women, and the time this change takes place is in the fifth decade of life. This tendency in the adult larynx towards ossification is perhaps not essentially different from the changes which take place in cartilage in other parts of the body at that time of life, and has probably no causative connection with cartilaginous tumors of the larynx. The opinion therefore of Bertoye that cartilaginous tumors of the larynx are an expression of an altered physiologic process is probably without foundation.

A study of the ten cases already mentioned in this article and of Alexander's twenty-six cases will show that chondroma of the larynx has a definite symptom complex. The nature and location of the lesion suggest of themselves alteration of voice and respiration. If the growth is small and not situated in the chink of the glottis, there may be absolutely no symptoms, as illustrated by Witte's two cases. If the tumor is large enough to obstruct the passage of air through the larynx, or even if small, is so placed as to interfere with the normal adaptation of the cords, there will be first an alteration in the tone of the voice, later hoarseness, and at last aphonia. Synchronously with increasing hoarseness, breathing ceases to be an unconscious act and becomes more or less difficult, which is noticed by the patient in shortness of breath, particularly after a little exertion. This difficulty of respiration increases to dyspnea, then to paroxysms of suffocation, which if unrelieved will sooner or later prove fatal. If the tumor be situated so as to press upon the esophagus, some difficulty and even pain may be felt upon swallowing. Furthermore, a cough may at times be present as the result of local irritation. The general health is not affected until near the end, when the respiratory act is greatly embarrassed. At this stage too a bronchitis may develop. As a rule the growth of the tumor is very slow and it is remarkable what size such a tumor may attain before it causes either local or general disturbance. In those cases where large tumors were found almost filling the entire laryngeal cavity without inducing suffocation or even very marked dyspnea, one is somewhat surprised at the disparity between the grave pathologic condition present and the absence of urgent symptoms. It must be remembered, however, that as such changes in the larynx take place very slowly, the patient is able to adapt himself to prevailing conditions and so continue to live quite a long time without great distress.

Chondroma of the larynx may be diagnosed in the majority of instances. If the tumor be situated externally on the outer wall, as in case 5, the hardness of the mass, its intimate connection with the cartilaginous framework, and the absence of enlarged lymphatic glands in the neck will justify a diagnosis. It must be remembered, however, that in malignant disease of the larynx cervical glands may be involved only late in the disease, as pointed out by Fränkel. If the cartilaginous tumor occupies the interior of the laryngeal cavity, diagnosis will be largely a matter of inspection and use of the probe. By the latter, its characteristic hardness is made out. By the laryngeal mirror or by direct laryngoscopy it will be seen that the growth is red or rose colored, and covered with normal mucous membrane. If the tumor is large, the mucosa will be stretched and the underlying tissue will shine through, giving the mass a pale rose appearance. In case 7 the mucous membrane was swollen near the attachment of the tumor, but as a rule the laryngeal mucosa is normal throughout. This is of great importance, as it distinguishes chondroma from all ulcerative diseases of the larynx, such as the second stage of malignant tumor, tuberculosis and syphilis. From malignant growth even in the first stage it ought not to be very difficult to differentiate chondroma, except perhaps when it is to decide between chondroma of the lateral thyroid wall and early carcinoma of the ventricle with prolapse. Even here the infiltrating base would probably betray the malignant character of the trouble. Cysts of degeneration may occur in chondroma, and Alexander says that a cystic chondroma may be hard to distinguish from carcinoma, though the latter develops more rapidly than the former. More difficulty, however, will be met when distinguishing cartilaginous from other benign tumors of the larynx. The hardness of chondroma tends to separate it from papilloma, and the regular smooth contour of the former, occurring only in adults, is in sharp contrast to the irregular, lobular surface of papilloma, which is found most frequently in children. A fibroma is a hard tumor, and its most common seat in the larynx is on the anterior half of the cord. Chondroma, on the other hand, could never arise from the cord any farther forward than the anterior limit of the processus vocalis. Angioma may be easily distinguished from chondroma by its dark brownish-red color, its uneven, mulberry-like surface, its compressibility and its soft consistency. Struma or accessory thyroid occurs in very rare instances in the larynx, and as it presents itself as a subglottic tumor with smooth surface and normal mucous membrane, it may be mistaken for chondroma. The hardness of the latter and the intense red color of the former may be distinctive, but a microscopic examination will probably be necessary for a positive diagnosis. Lipoma with its softness and elasticity may be sufficiently characteristic when contrasted with the decidedly unyielding hardness of chondroma. A fibrolipoma, however, containing much connective tissue, may resemble chondroma so closely that a naked-eye diagnosis may be impossible. Myxoma, fibromyxoma, and amyloid tumors of the larynx may present almost insuperable difficulties for differential diagnosis. In all cases of doubt the safest means is the microscope, and a small piece of the tumor may be removed for examination. This perhaps applies to all neoplasms of the larynx except vascular tumors like angiomata, where the removal of tissue in situ by cutting instruments through the natural route might induce hemorrhage which would be difficult if not impossible to check.

The prognosis of laryngeal chondroma is good. Before the days of the laryngoscope all such cases ended fatally. Since diagnosis by inspection was made possible by that instrument most of the cases have been cured. With greater familiarity of the laryngoscope on the part of the general practitioner, all tumors of the larynx would be diagnosed much earlier. Every case of hoarseness or even alteration of the normal voice without apparent cause should be carefully investigated. If such were made a rule laryngeal tumors would come under treatment earlier. Small cartilaginous tumors have certainly a better prognosis than the large, though even the latter are within the possibility of perfect cure. Recurrences are rather infrequent.

Treatment of cartilaginous growths of the larynx may be said to be surgical. Drugs are entirely inert, Roentgen rays have not been tried sufficiently to justify any opinion of their value, and radium, as far as the writer knows, has not been tried at all. Removal by instrumentation is the proper treatment at present. If the tumor is small, especially if it is more or less pedunculated, it may be removed with cutting forceps or some similar instrument by the endolaryngeal route. If medium sized, the growth may be best attacked by direct laryngoscopy. If large it will require the external operation, thyrotomy or laryngofissure. In case the cricoid plate is the seat of the tumor, care must be exercised not to use too much force with the curette in removing the growth for fear of perforating into the esophagus. In the rarer instances where the laryngeal framework is extensively invaded by the neoplasm, a partial resection or even total extirpation of the larynx may be necessary.

In conclusion the following recommendations are suggested:

1. There should be uniformity of nomenclature. The term enchondroma should retain the meaning given it by Virchow and should not be applied to growths of the larynx, these being either chondroma, ecchondroma, ecchondrosis, or mixed tumor.

2. Ecchondroses of the larynx should be regarded as overgrowths of cartilage, not real tumors.

3. Although chondroma has been known to recur and even to metastasize, it is not an invasive neoplasm in the broad sense of the term and should be looked upon rather as benign than malignant.

4. Although the clinical aspect of the disease is quite definite,

the etiology is still much in doubt. In 1888 Bruns said "cartilaginous tumors of the larynx are so rare that the study of every case is of the greatest value in order to establish the clinical course of the disease and to furnish data for proper therapeutic measures." The clinical course of the disease has been pretty clearly determined by the various cases published since Bruns' article. The histologic and pathologic phase of the subject has been well brought out by Alexander's work. The etiologic phase, however, lags behind and invites further work and careful investigation.

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No.	Author and Literature.	Sex and Age.	Location of Tumor.	Appearance of Larynx.	Symptoms.	Treatment.	Result.	Histologic examination	Author's Diagnosis.
1	Witte. Arch. of Laryn., vol. XI., 1901.	Male. 45.	Arytenoid.	Round, hard growth on anterior surface of each arytenoid; right about 6 mm. long, left about 4 mm. Mucous membrane normal.	None.	None.	No increase in size in 5 years.	Not made.	Ecchondrosis
2	Witte. Idem.	Male. 34.	Arytenoid.	Round, hard growth on inner side of left arytenoid, 4 mm. long. Mucous membrane normal.	None.	None.	Not given.	Not made.	Ecchondrosis.
3	VanEeckhaute Ann. d. l. soc. de Med. de Gand, 1902, vol. 81.	Male. 35.	Cricoid.	Hard growth, size of pea, under right vocal cord anteriorly; pedunculated, immobile.	Hoarseness and cough for 6 months. Later, aphonia. Slight pain in larynx.	Removed with cutting forceps	Removed; restoration of voice	Not made.	Enchondroma.
4	Boerger. Berl. klin. Wochensch., 1904, vol. XLI.	Male. 50.	Cricoid.	Larynx filled with hard tumor, covered with pale but otherwise normal mucous membrane; movement of right cord slightly restricted.	Difficult deglutition for 5 years. Hoarseness for 2 years. Difficult breathing, later dyspnea and attacks of suffocation.	Total extirpation of larynx.	Death 12 days later.	Not made.	Chondroma.
5	Alexander. Berl. klin. Wochensch., 1906, XLIII.	Male. 33.	Thyroid.	Large hard mass on right side of thyroid cartilage externally; nothing pathologic in interior of larynx.	Tumor painful on pressure. No hoarseness. No difficult breathing.	X-ray	Slight decrease in size.	Not made.	Chondroma.

No.	Author and Literature.	Sex and Age.	Location of Tumor	Appearance of Larynx.	Symptoms.	Treatment.	Result.	Histologic examination	Author's Diagnosis.
6	Hartlieb. Munch. med Wochensch., 1907, LIV.	Male. 45.	Thyroid.	Tumor, size of large nut, on left and posterior wall of thyroid, extending to cricoid, covered with normal mucous membrane.	Increasing difficult breathing, made worse by exertion.	Shelling out submucously.	Recovery. Posticus paralysis.	Made but no details given	**Enchondroma.**
7	Landwehrmann Zeits. f. Ohr., 1909, LIX.	Female. 28.	Arytenoid.	Hard growth on right processus vocalis, several mm. long and about same wide.	Hoarseness for 2 years. Paralysis of internus.	Removal with double curette.	Recovery. Paralysis of internus.	Made but no details given	**Ecchondrosis.**
8	Don Mansfeld. Arch. f. Laryn., 1909, XXII.	Male. 50.	Cricoid.	Mucous membrane on posterior wall below glottis swollen Tumor encroached very much upon lumen of larynx.	Difficult breathing for 2 years. Hoarseness. Pain upon swallowing	Intubation. Later laryngofissure.	Death 20 hours after operation.	Cartil. cells in capsule. Stellate cells	**Myxomatous Chondroma.**
9	Moure and Daure. J. de Med. de Bordeaux, 1910, XL.	Male. 62.	Cricoid.	Larynx filled with hard, round, smooth tumor. Mucous membrane normal. Swelling on left side of larynx externally.	Alteration of voice for 6 years. Hoarseness for 2½ years. Dyspnea for 2 years.	Preliminary tracheotomy. Laryngofissure under cocain	Recovery.	Cartil. cells in hyaline matrix. Few stellate cells	**Enchondroma.**
10	Carroll.	Male. 34.	Cricoid.	Firm growth filling the subglottic space, covered with normal mucous membrane. Left cord fixed. Imperfect motion to right. Enlargement of right side of thyroid cartilage externally.	Hoarseness for 4 months. Aphonia for 3 weeks. Difficult breathing for 3 months. Cough.	Preliminary tracheotomy. Larygofissure.	Recovery. Persistence of hoarseness.	**All forms of cartil. cells. Hyaline with mucoid degeneration. Some calc. and bony deposits.**	**Ecchondroma.**

LXII.

A CASE OF MULTIPLE FOREIGN BODIES IN THE SMALLER BRONCHI.*

By F. E. Hopkins, M. D.,

Springfield.

Bronchoscopy is sufficiently recent, and individual cases vary so greatly in the range and difficulty of the problem presented, as to warrant the recording of each case. The following case was inevitably fatal and falls into the class of the interesting rather than instructive:

E. U., girl, four years old, with a history of having inspired a peanut, was courteously referred to me by Dr. W. G. Craig, of Springfield, on June 5th, 1910. On the chance that the foreign body might be of a character to be located by the X-ray, Dr. Van Allen made an examination, although he stated that if it were a peanut no shadow would appear, and the plate proved to be negative.

Bronchoscopy showed no foreign body in the trachea or in either right or left bronchus. This outcome was highly disconcerting. The history was clear—the child, in the presence of both parents, was eating peanuts when it coughed, and on the deep inspiration following was thrown into great distress, breathing with much difficulty and coughing violently. The cough ceased after about half an hour, but there was no relief to the labored breathing. The hospital records, made when the patient was received, mention marked retraction of chest walls on inspiration, wheezing and whistling rales over both lungs, small area of dullness above right nipple. Temperature normal, and pulse 100. The bronchoscopy proving negative, I was at the limit of my resources, nor could other members of the hospital staff give aid.

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*Read at the Thirty-third Annual Congress of the American Laryngological Association, held at Philadelphia, May 29th to 31st, 1911.

After two days the patient's condition being yet more desperate, bronchoscopy was repeated, Dr. Dudley Carleton, surgeon on service, being present to do a tracheotomy, that a shorter, wider tube might be used if this seemed advisable. As in the first instance, examination of trachea and right and left bronchi was quickly and easily made and tracheotomy was not done.

The child died an hour later, and autopsy showed many small fragments of the nuts scattered throughout the lungs, and around each fragment a congested and hemorrhagic area. Twenty-four of these fragments with their pneumonic areas were counted. Instead of a single nut occluding the trachea or larger bronchi, the many fragments of the well-chewed nut were shot into the smaller bronchi.

For the notes on this unusual case I am indebted to Dr. H. A. Schneider, house surgeon of the Springfield Hospital.

LXIII.

CONTRIBUTION TO PASSIVE IMMUNIZATION IN DIPHTHERIA OF THE UPPER RESPIRATORY ORGANS.

(PRELIMINARY REPORT.)

By Henry Lewis Wagner, M. D.,

San Francisco.

Induced by the experiments of S. Dserzgowsky* in the active immunization of the upper respiratory tract against diphtheria, I have tried, on a small number of patients, local passive immunization in acute diphtheria, with results that may be of general interest.

In making these experiments I had two objects in view: (a) to study the effects of the antitoxins on the diseased tissues when locally applied, with the end in view of ascertaining whether results might not be obtained analogous to those now proving so successful in the influencing of infectious meningitis by intralumbar injections;† and (b) to endeavor to prevent or at least to modify the anaphylaxis following the use of high potential serum when applied in small quantities and at brief intervals during the initial stages of the treatment.

The following is the method I have selected and used: Whenever the patient did not show an absolutely clear picture of diphtheria vera secretions were taken from the throat, and from the nasal passages as well, for bacteriologic examination. The nose and throat were then sprayed at fifteen minute intervals with the strongest serum combined with a 3 per cent watery solution of calcium chlorid in the proportion of 1 to 2; 5000 units of serum being used within the first three hours.

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*See his last report in Berliner klinische Wochenschrift, 1910, p. 2042.

†As contrasted with the method of subcutaneous or venous injections.

Later the amount employed was determined entirely by the prevailing conditions, the intervals between successive sprays being lengthened.

In this treatment I attach especial importance to the spraying of the nasal passages, as the lymphatic system of the posterior lateral portions of the nose influences the entire area of the Waldeyer glandular ring, embracing the throat and upper larynx.

Whenever the nose was obstructed by swelled tissues a diluted suprarenal capsule solution preceded the serum and calcium chlorid application, so as to permit the latter to enter into the inflamed hollows and crevices.

In cases where examination disclosed the presence of diphtheria, either plain or mixed form, the results from this local treatment were very gratifying; after a few hours the intense venous hyperemia became less; the odor was less fetid and the subjective symptoms were improved; the disease became localized and did not show any tendency to spread further down.

When the disease presented itself at the first inspection as already quite developed, subcutaneous injections of high potential serum were combined with local immunization; comparatively fewer injections were needed, the number being entirely governed by conditions of the affected parts and of the heart.

The question arises, how does the antitoxin, when applied locally, react on the locus morbi? I do not believe that the antitoxin colloids combine here locally with the haptophore group of the toxin molecule, as the toxins are continuously being carried away by the blood and lymph stream throughout the body; very probably we are dealing here with a process of phagocytosis by the aid of bacteriotropins.

The addition of the calcium chlorid to the serum was made with the intent of preventing or lessening the serum disease (anaphylaxis) either in its early or in its late form; with this, however, I have been less successful, though continue to use this combination as calcium ions act as an antiphlogistic (Leo), stimulate the heart (Leo), and increase the power of blood coagulation (Wright).

Apropos of this last point, Weiss and Tsuru have found the index of blood coagulation lowered in diphtheria, a condition which I have observed may persist for some time, and this fact should be given careful consideration whenever a resort to surgical treatment is deemed necessary in the case of a patient who is convalescing or has but recently recovered from this disease.

I have no difficulty in accepting the view that local passive immunization will lessen the number of diphtheria germ carriers, a most welcome result in view of the fact that this latent form of the disease is very difficult to exterminate.

LXIV.

CIRCULATORY AND RESPIRATORY REFLEXES AND NEUROSES FROM THE UPPER AIR TRACT.

By W. Sohier Bryant, A. M., M. D.,

New York.

The laboratory and clinical observations that have been made upon reflexes and reflex neuroses generally are now sufficiently well correlated to make it possible to demonstrate the vital importance of the upper air tract with respect to its reflex action. The upper air tract here considered includes all parts of the nose, together with the pharynx.

The term "reflex" is a loose one. It is commonly applied to all automatic acts operating in any part of the nervous systems—the cerebrospinal and the somatic or sympathetic—notwithstanding the fundamental etiologic differences of these nervous systems. Abnormal or pathologic reflexes are usually called reflex neuroses. These latter are identical in their action with normal reflexes, the only difference being that the production of the reflex neurosis is abnormally easy, i. e., it occurs with a minimum, less than normal, intensity of stimulation.

The distinguishing characteristic of the reflex is its conservative function. Its most definite purpose seems to be the protection of the organism against foreign and injurious elements. The cough, sneeze, hiccough, vomiting—these are typical protective reflexes arising in the upper air tract at the entrance of dust, smoke, food unfit for consumption, etc. The reflex mechanism guards the body against the intrusion of all harmful agents. Hence the importance of the upper air tract in its reflex action is obvious: it controls the intake of all nutriment, air, water, and food.

In the case of violent irritation of the upper air tract by smoke, noxious fumes or gases, a defensive attitude is instantly assumed; there is cessation of respiration during the expiratory movement, the purpose being to ward off or expel all harmful fumes. Conversely, in obstruction of the upper air tract by foreign bodies, in choking, there is an arrest of respiration during inspiration. The aim here is to take in all the respirable air that can be obtained, so as to prevent asphyxiation. At the same time there is a backing up of blood in the pulmonary circulation, with consequnt lung distention due to inhibited cardiac contraction. This phenomenon has a doubly conservative purpose: first. to increase the capacity of the lungs; and secondly, to reduce the supply of oxygen carried to the tissues, so as to defer complete asphyxiation.

These defensive manifestations of the organism are entirely nonpathologic in their action. They are the response that every normal individual makes to harmful stimuli. Such reflex action can be considered pathologic only when these reactions are produced with very slight stimulation, i. e., when abnormally profound reactions such as have been described are produced without violent irritation. We then have the reflex neurosis.

The chief differentiating characteristic of the reflex neurosis is its destructive action. As a typical neurosis of the upper air tract may be mentioned reflex asthma which concerns both the pulmonary and the circulatory system, causing functional emphysema or pulmonary dilatation and pulmonary congestion. The mechanism of asthma is identical with that of the normal reflex when there is acute occlusion of the upper air passages. This causes dilatation of the lung through impeded expiration and pulmonary blood stasis due to lowered intracardiac blood tension.

The reflex tendency to increase the lung capacity and the retention of respirable air is a conservative measure. The corresponding reflex neurosis—which is destructive, like all reflex neuroses—prevents the individual from using his otherwise comparatively normal respiratory mechanism.

In the reflex neurosis the exciting stimulus starts in the upper air tract and conveys the pathologic centripetal impression through the trigeminus nerve and the sphenopalatine ganglion to their respective centers. The impression conveyed is the same as when the upper air tract is seriously occluded. The centrifugal impulse passes over the pneumogastric to the heart and the phrenic to the pulmonary apparatus, causing the typical condition of asthma.

For our knowledge of these reflexes we are especially indebted to Grossman of Vienna, who in his experiments upon living animals has demonstrated that through stimulation of the upper air tract by artificial occlusion, normal reflexes similar to asthmatic symptoms may arise. Experimental and clinical observations demonstrate that the asthmatic syndrome may appear in varying mild degrees. There may be slight functional emphysema or slightly impeded expiratory movements only, with moderate engorgement of the pulmonary circulation.

The writer's clinical observations have led him to realize the vital importance of the upper air tract in old age, and in chronic and acute diseases when some of the asthmatic symptoms are present. Total or partial occlusion of the upper air passages in such cases is of the utmost significance to the patient. Even slight contacts between the turbinal bodies of the nose and neighboring surfaces, or hypersensitivity of the mucous membranes without any contacts at all, may be causative of symptoms that in connection with other pathologic conditions will produce fatal results. I believe that not infrequently the reflexes of the upper air tract determine whether or not the other pathologic conditions will terminate fatally or otherwise. Through their inhibitory cardiac action and interference with respiration, these reflexes in many cases augment the gravity of disease to a material extent.

Etiology of the Asthmatic Reflex and Asthmatic Neurosis.—As we have seen, the asthmatic reflex is caused by obstruction of the upper air tract. It is the unconscious expression of nasal stoppage and air hunger. The asthmatic neurosis, or true asthma, is due to hyperesthesia of the mucous membrane of the upper air passages and to a deficiency of inhibitory power in the nerve centers. The deficiency in the nerve centers is usually hereditary, or it may be acquired through exhaustion or toxic irritation. The hyperesthesia of the mucous membrane appears also to depend upon heredity, sensory exhaustion, or overstimulation and toxic irritation. Local causes such as toxic irritation and morphologic irritants, as well as irritation from impure air, may be the cause of the hypersensitivity of the mucous membrane. Asthma is the unconscious expression of the neurotic impression of nasal stoppage and air hunger.

Diagnosis.—The diagnosis of these obstructive and hyperesthetic conditions can be demonstrated in two ways:

(1) By shrinking the engorged tissues with adrenalin to a sufficient degree to open the passages, thus relieving the local surfaces from irritating contact and effecting amelioration of the asthmatic symptoms.

(2) By anesthetizing with cocain the nerve terminations that supply the constricted region or the hyperesthetic membrane.

If either of these methods produces marked amelioration of the pulmonary and circulatory symptoms, a diagnosis of asthmatic reflex or neurosis is justified.

Treatment.—The emergency treatment of these asthmatic cases is limited to local applications. In chronic conditions where time will permit, the nasal contacts, obstructions, and hyperesthetic areas should be removed by the usual therapeutic and surgical methods.

Prognosis.—The results to be anticipated from treatment are improvement of the circulatory and respiratory symptoms —in other words, a profound amelioration of the pathologic conditions. Complete recovery seems to depend upon continued treatment of the upper air passages. Through my clinical experience I have been led to expect that in urgent cases, local applications will afford instant relief varying in length of time from one hour to several hours; and that if life is prolonged and treatment continued, the fundamental pulmonary and circulatory conditions tend to recover. The intervals of relief will lengthen rapidly in response to repeated applications.

Illustrative Cases.—(1) A man forty years old. Nasal breather. Acute infection of the respiratory tract, "grippe." Face white and haggard. Pulse intermitting many beats; almost stopping. Respiration labored and shallow. Temperature 102 degrees. Sensation of suffocation and imminent death; patient apparently in extremis. Foot of bed raised. Subcutaneous injection of strychnin had given no relief. Application of cocain and adrenalin along lower and middle turbinals brought instant relief from subjective symptoms with improvement of respiration and regular pulse. Relief lasted four hours, when there was another attack of dyspnea, pallor, and heart stoppage. Another nasal application relieved the condition more completely, after which the patient passed to final recovery in a few days.

(2) A man seventy-three years old. Recent fracture of arm from collision with automobile. Pale, heavy, stout man, of senile appearance, nearly bedridden and despondent. Nose breather. Before accident was fairly active and comfortable. Pulse slow, weak. Respiration slow. Nasal inspection showed hypertrophied turbinals, no notable respiratory obstructions, but contacts. Repeated shrinkage of the hypertrophic turbinals by adrenalin and iron salts soon relieved contacts in nose. The circulation and respiration improved, and patient was restored to as good or better health than before accident. In two months the patient was looking and feeling very well and much younger.

Conclusion.—In conclusion I wish to say that unless the upper air tract is in no way obstructed and is not hyperesthetic—which is rarely the case—the patient suffering from emphysematous symptoms and pulmonary congestion is not receiving the attention to which he is entitled if the upper air passages are ignored. Under such circumstances we cannot overemphasize the importance of treating the upper air tract, so as to minimize the danger arising from the reflex neuroses which are so abundantly found to emanate from this region.

LXV.

PNEUMOCOCCUS INFECTIONS OF THE THROAT.*

By Harold Hays, A. M., M. D.,

New York.

During the past two years I have had occasion to see in my practice five cases of a supposedly rare infection which has been little described in the literature. The condition to which I refer is the invasion of the throat by the pneumococcus, the infection giving rise to a clinical picture which in certain instances varies greatly, but in others forms a definite entity.

Rendu and Boulloche in 1891 described two cases of acute pharyngitis with sudden onset, accompanied by high fever of short duration, occurring in individuals who were exposed to pneumococcic infection and slept in the same room. The pneumococcal origin of the infection was proved by the inoculation of rabbits. In neither of these cases was there an ulceration or a false membrane. Cornil described a case of abscess in the tonsil due to the pneumococcus. Jaccoud described a case of pseudomembranous pharyngitis of similar origin. In 1901 Monro described a case of membranous pharyngitis which he considered to be of pneumococcal origin, as also have Bezancon and Griffin, who used the agglutinative serum reaction to prove their case.[1]

Elliott in the *British Medical Journal,* in a very instructive article entitled "Remarks on Acute Pneumococcus Infection of the Pharynx," describes a clinical picture which conforms very closely to the cases I have seen. He says: "I saw several cases of pharyngitis with fever and considerable enlargement of the cervical glands, the latter being a prominent feature of the cases. The submaxillary lymphatic glands, the deep cervical glands under the sternomastoid, and also glands below the lobule of the ear, were enlarged, forming a mass, which, in the early stage, might lead one to make a diagnosis of mumps (an experience which fell to my own lot in one of my cases). The glands on both sides of the neck were enlarged but more extensively on one side. The accompanying fever was not unusually high, 102° to 103°. The onset was sudden; the whole of the back of the pharynx was swollen, red and inflamed. Sometimes the tonsils were considerably enlarged, with follicular concretions visible. The fever was of short duration, about forty-eight hours, with slight rise of temperature in the evening for several days longer."

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*Read before the Laryngological Section, New York Academy of Medicine, November 22, 1911.

The author concludes as follows:

1. These cases were not influenzal in origin, for the usual visitation of influenza came later, and several of these cases afterward developed influenza, which ran a typical course.

2. Although no trace of exposure to infection from pneumonia could be found in any of the cases, it was unusually prevalent at the time.

3. In two of the cases where cultures were taken, the pneumococcus was found, and taking into consideration the similarity of the other cases, the remarkable glandular enlargement which was a feature of them all, and the facts that the others were exposed to the same infection as the two investigated, there can be little doubt that the pneumococcus was responsible for all the trouble.

In November, 1908, Sir Felix Semon, in the *Medical Magazine,* described two cases of a hitherto unrecorded affection of the throat caused by the pneumococcus. These cases showed the most surprising fluctuations "between intensely painful inflammatory conditions of the throat and improvements which appeared to render complete and speedy recovery almost a certainty, but which repeatedly gave way to absolutely unexpected aggravations, until finally—in the one case certainly spontaneously, in the other during an iodid of potassium treatment—complete recovery took place." These cases were characterized by profound asthenia, by ulceration of the affected parts, by an almost entirely afebrile course, and by *complete absence of swelling of the cervical lymphatic glands* (italics mine); in the first case the pneumococcus was found in pure culture, while in the second, the pneumococcus predominated. In both cases toward the end "a punched-out loss of substance occurred, whilst by far the greater part of the ulcers healed without leaving any scar behind."

In a later paper[2], this distinguished author relates in great detail an extremely interesting and sad case in which a physician suffered from a pneumococcus infection of the throat with a final complication of laryngeal and pulmonary tuberculosis. In this case ulceration occurred at first in the lateral wall of the throat opposite the last molar tooth. There was also considerable swelling of the lingual tonsil. Fresh ulcerations later developed on the posterior pharyngeal wall and great tumefaction of the vocal cords and arytenoids was present. Examinations bacteriologically of cultures from the pharyngeal ulcerations and inoculations into mice proved the presence of the pneumococcus. "Whilst the pharyngeal specimens were simply teeming with pneumococci without any evidence of tuberculosis, the scrapings taken from the ulcerated spots on the artyenoid cartilage contained large clumps of tubercle bacilli. . . . It seemed, therefore, quite evident that tuberculous infection had supervened upon the pneumococcus infection." The patient died seven months after the onset of the disease. A case of tuberculosis of the larynx, supervening on a pneumococcus infection of the pharynx is unique in the annals of laryngology.

The cases which I have seen personally correspond more closely to those described by Mr. John Elliott, although one of my cases showed a superficial ulceration closely resembling an infection by the spirillum and bacillus of Vincent. In three of these cases, slides and cultures were made and almost a pure culture of the pneumococcus found.

Case 1.—A young man, 24 years of age, whose right tonsil I had removed the year before, came to me after a trip on the road. He told me he was sure he had another tonsillitis and chided me about the work I had done on his tonsil. The left tonsil was very small and had never given him any trouble. Examination of the throat revealed an intensely engorged mucous membrane, edematous and showing a small superficial ulceration on the posterior pharyngeal wall on the left side. The throat was so intensely inflamed and edematous that there was hardly any breathing space, the uvula was twice its natural size and the pillars of the fauces almost came together. I took a smear at the time in order to differentiate Vincent's angina and diphtheria, and immediately made a culture. The smear showed organisms morphologically resembling pneumococci and the culture showed the same organism.

The patient's temperature was 102° F. There was moderate enlargement of the upper cervical lymphatics. I had the patient go to bed, gave him a brisk cathartic, cachets of analgesics, a gargle of peroxid of hydrogen and formaldehyd throat lozenges. The next morning the patient was better, the temperature being down to 100°. Not having had much experience with such cases, and the weather being of the usual inclement kind we have in the middle of winter, I decided he was better off in a hospital, where he went for three days. Much to my relief, with rest in bed and the treatment I outlined above, he recovered entirely.

Case 2 was another young man of about the same age, who was sent to me by his family physician. This case presented the exact picture described by Elliott. The throat was intensely inflamed and edematous, breathing and swallowing were difficult, the temperature was about 102°, the cervical glands were much enlarged. The patient was intensely prostrated. There was no ulceration present. At first I made a diagnosis of rheumatism of the throat, but taking a smear and culture, as I do in most acute throat cases, I found that the infection was due to the pneumococcus. After giving him some local treatment I sent him home to go to bed, where he remained for two days. After two days more local treatment he recovered entirely.

Case 3.—A young married woman of twenty-five, about three weeks before her confinement developed a "sore throat." When I saw her she presented all the symptoms of influenza. The symptoms were about the same as those outlined above. On the fourth day she developed an acute otitis in the right ear and later a mastoiditis of pneumococcus infection. Two days later an infection of the left ear took place. She recovered from her nose and ear illness after operation on the mastoid.

The remaining two cases presented similar symptoms, but in these no cultures were taken. However, from the course of the disease in both instances I am convinced that it was due to the pneumococcus.

I shall now enumerate very tersely the general course of pneumococcus infections of the throat, as they developed in my own cases and those of Semon and Elliott.

Etiology.—The infection occurs during the winter months of inclement weather when pneumonia, influenza and rheumatism are very prevalent, and there is no way of definitely differentiating the condition and stating that the pneumococcus is the cause of the trouble, unless a culture is taken. A peculiar fact is that the disease seldom is complicated by a true pneumonia. Age and sex and general predisposition make very little difference.

Symptoms.—The disease usually comes on suddenly with moderate temperature and intense congestion and edema of the throat, together with an inflammation of the anterior cervical chain of glands. The prostration is usually considerable. Swallowing is painful and the patient constantly attempts to spit out a quantity of thick, tenacious mucus. In a few cases ulceration of the mucous membrane of the pharyngeal wall, uvula or pillars of the fauces may occur. The ulceration is superficial, well circumscribed, covered with a whitish gray film, and is surrounded by a deeply congested tissue. More than one ulceration may be present.

The course of the disease is usually short, terminating by lysis. The mucosa assumes its normal appearance and even though ulceration has occurred it is so superficial that no scarring is left.

Differential Diagnosis.—This condition must be differentiated from diphtheria, Vincent's angina, tuberculosis, influenza and rheumatism. Clinically it is differentiated from diphtheria by the lack of membrane or the circumscribed character of the membrane if one is present; from Vincent's angina it differs by the ulceration being more superficial, the shortness of the illness, by the ulceration not showing a tendency to spread and by the intense surrounding inflammatory reaction; it is differentiated from a tubercular inflammation by the moderate amount of pain and the superficial character of the ulceration; from influenza it is differentiated by its occurrence often when influenza is not epidemic or endemic, by the lack of complications and by the swelling of the cervical lymphatics; from rheumatism it is differentiated by the shortness of the illness and the lack of any rheumatic affection elsewhere. A positive diagnosis can only be made by cultural examinations of the throat.

Prognosis.—Uneventful recovery occurs in most cases, particularly when there is no ulceration. Complications are few and within five to seven days the patient fully recovers. In one of my cases a mastoiditis occurred; in one of Sir Felix Semon's cases a fatal tuberculosis supervened.

Treatment.—Rest in bed with ice cloths around the neck, is of utmost importance. A brisk cathartic should be given and some form of antipyretic and analgesic is usually necessary to reduce the fever and to overcome the headache and general pain. Local measures, with the exception of nitrate of silver, are of little service. This astringent may be used in mild dilutions to relieve the congestion, but where ulceration is present one can use a 50 per cent solution on the ulcerated area without doing any harm. No warm or heavy food should be taken. The oral cavity can be kept moderately clean and comfortable by gargling with a mild alkaline solution or peroxid, and dissolving a formaldehyd tablet in the mouth every few hours. The most important therapy is rest in bed and ice compresses applied to the neck.

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1. All these references have been taken from a paper by John Elliott in the British Medical Journal, June 26, 1909.

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LXVI.

METHODS OF GIVING ANESTHESIA IN OPERATIONS UPON THE UPPER RESPIRATORY TRACT.*

By James T. Gwathmey, M. D.,

New York.

The surgeon operating upon some part of the upper respiratory tract may choose from such a diversity of agents and methods for inducing and maintaining anesthesia, that his final selection in the vast majority of cases should be such as to eliminate absolutely any question concerning the safety or aftereffects of the anesthetic. As the writer was told upon several occasions that the object of this paper was to provoke discussion rather than to emphasize any particular anesthetic or technic, the subject will be treated in a broad and liberal way.

First. The agents used at the present time for local anesthesia are: cocain and its many allies, morphin, ethylchlorid and sterile water.

Whenever possible, morphin should always precede cocain, rendering the latter safer from inhibitory reflexes, improving the anesthetic, and removing the psychic element.

Second. The general anesthetics are: nitrous oxid gas, ether, ethylchlorid, anesthol, chloroform, morphin; and in emergency cases, alcohol in the form of whiskey or brandy, combined with morphin.

The best results are obtained when the agents enumerated above, both local and general, are used in combination and sequence, as indicated by the condition of the patient, the nature of the operation, and the demands of the surgeon.

Third. The methods employed are as follows: spinal analgesia; rectal anesthesia; intravenous anesthesia; regional anal-

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gesia; morphin anesthesia; combined local and general anesthesia; hypnotism, alone or, preferably, mental suggestion combined with other methods; the sequestration method; intratracheal anesthesia; and finally, pulmonary anesthesia by the nasal or oral route, with or without valves and with the gas or vapors under ordinary or positive pressure.

One successful case of a surgical operation upon a human being with electrical anesthesia[1] was reported from Hartford, Connecticut, in April, 1910, but as no subsequent cases have been mentioned, this method cannot be considered as practical at the present time. Few surgeons would think of hypnotism in this connection, but every physician should know that certain persons can be operated upon when in this state. All patients are affected more or less by mental suggestion. This was most strikingly illustrated a few nights ago in a clinic with which I am connected. At my suggestion a phonograph was started thirty minutes before the time for operating, and at that time not one of the group of five to eight children operated upon for adenoids and tonsils, cried or objected in any way to the anesthetic. In another hospital the surgeons united in the effort to eliminate the element of fear by ignoring or denying there is any danger in connection with the anesthetic. The idea being that fear is one of the contributing causes to nausea and vomiting, especially in the induction period. The result of the combined efforts are reported to be most satisfactory. Adults are especially open to mental suggestion after small physiologic doses of morphin.

The sequestration method[2] consists of getting the patient under narcosis with some pulmonary anesthetic and then using the inner tire of an automobile, or preferably the cuff of some blood pressure apparatus, placed at the upper part of the thighs, and also close to the armpits, making pressure, and thus cording off this amount of blood from the body. The patient is then placed in a sitting position. The anemia of the brain thus produced is depended upon to continue the narcosis. The bands are gradually loosened and the anesthetic discontinued or only small amounts used. Anesthesia usually lasts for from five to fifteen minutes, without a reapplication. This method is safe, for if any untoward symptoms appear, a reversal of the patient's position immediately rectifies the trouble. Chloroform is the only anesthetic contraindicated with this method. Toward the close of operations lasting an hour or more, a useful modification of this method will be found in the raising of the head of the table slightly, after which very small amounts of the anesthetic will be necessary to complete the operation. In some cases the anesthetic may be entirely withdrawn. A patient under an anesthetic is quickly responsive to changes of body position.

Rectal anesthesia[3] is especially useful in all head surgery. As introduced by Dr. Cunningham, of Boston, and greatly improved and modified by Dr. Sutton, of Kansas City, it is perfectly safe in selected cases. This method has not made very great headway in the last few years. As the anesthetist is compelled to be at the head of the patient in order to note the reflexes, the writer of this article sees no advantage in this method over vapor anesthesia.

Spinal anesthesia seems to be slowly gaining favor. With the perfect technic that now obtains it is comparatively safe. It is less available for head surgery than for other parts of the body. When the head is to be operated upon, the Trendelenburg posture, as suggested by Jennesco, is used to obtain the analgesia. In point of safety it cannot be compared with the best local and pulmonary methods. A German statistician[4] recently compiled for his confreres a series of 2400 cases with twelve deaths. American statistics give much better results.[5]

Intratracheal anesthesia,[6] as introduced by Dr. Meltzer of the Rockefeller Institute, should be encouraged and developed by those composing this association. This method consists in getting the subject under a pulmonary anesthetic and then passing a rubber catheter two-thirds the size of the trachea to its bifurcation and then alternately passing the ether vapor and air through this tube. Upon the lower animals the success of the method is unquestioned. Between fifty and one hundred cases have been reported so far upon human beings. Unfortunately one death has occurred through faulty technic. In the experimental laboratory every requirement of a perfect anesthetic is met: absolute relaxation; infinitesimal amounts of ether; perfect control of the degree of anesthesia; abolishing reflexes or allowing them to appear at will; and the absence of aftereffects. This method of anesthesia deserves every encouragement and a thorough trial; and in the meantime, a suspension of judgment and absence of criticism.

By morphin anesthesia is meant giving a full physiologic dose of morphin and hyoscin, and supplementing this with a few drops of the anesthetic chosen, or preferably with nitrous oxid gas and oxygen at normal pressure. This method is useful when, for any reason, ether or chloroform are strongly contraindicated. Dr. James P. Tuttle, of New York City, in connection with Dr. Jerome M. Lynch, reports over two thousand cases without a single death. The usual dose is one-fiftieth of a grain of hyoscin and one-quarter of a grain of morphin. This is given in two periods, the first gr. 1/100 two hours, and the second gr. 1/100 thirty minutes before the operation. One-quarter of a grain of morphin is added to the second dose. (This last medication is omitted or decreased according to the condition of the patient at that time.) The contraindications to this method are an acute or subacute nephritis; a very rapid heart also indicates smaller doses of hyoscin.

Intravenous Anesthesia.[7]—The first experiments were on animals with the different narcotics and analgesica. Ether in a 5 per cent solution was finally selected as the best agent, used alone or in sequence with isopral. A special apparatus regulates the flow of the anesthetic drop by drop. Not over three hundred cubic centimeters were used with any patient.

Two hundred and fifty cases are reported with no fatalities. The objections stated are the long postanesthetic stage (seven to eight up to twenty-four hours) and incomplete anesthesia and relaxation, increased blood pressure and thrombosis formation in the veins; also lack of control over the dilution of the ether.

Regional Anesthesia.[8]—This method should be used with morphin and some local anesthetic instead of alone. Anemia of an extremity is induced by raising the part, thus emptying the vessels, as far as possible, by gravity. A bandage is then applied from the lesion to the trunk; another below the lesion so that there is an anemic area at least 15 cm. wide. Whenever local anesthesia of an extremity is incomplete by the usual methods, this procedure should be added.

The scientific basis for the successful administration of all pulmonary anesthetics consists, in addition to the usual preparation of the patient: First—Some preliminary medication.[9] Second—Anesthetic so arranged that any sequence or combination can be quickly made without interfering in the slightest with the operation. Third—All anesthetics heated to the temperature of the blood. Fourth—Combined with oxygen when indicated.[10] Fifth—Apparatus so constructed as to be able to administer the gases or vapors under normal atmospheric pressure or positive pressure and with moisture, and either with or without valves.

Preliminary medication given thirty minutes before the operation quiets a patient, as indicated by the normal heart sounds; shortens the period of induction; abolishes unnecessary reflexes and blunts others, including the vomiting center; diminishes the amount of the anesthetic one-third to one-half; renders holding and strapping unnecessary; diminishes the secretion of saliva to a negligible quantity; and finally allows the patient to come out of the anesthetic as in the induction, quietly and naturally. The following plan has successfully been used in connection with morphin:

To relieve the dryness of the mouth and thirst after the operation, one or two pints of normal saline should be given per rectum five to ten minutes before the close of the operation, and while the patient is in full surgical anesthesia. This procedure brings the patient out strong, and usually with no disposition to vomit.

Nearly all patients should have the benefit of the induction of the narcosis with nitrous oxid gas and oxygen.[11] The continuance with this combination would depend upon many circumstances unnecessary to go into at this time. If a change is indicated, an even narcosis can be maintained with warm ether or chloroform and oxygen, while the final stages of any operation lasting one hour or more should be nitrous oxid gas and oxygen. When this plan is followed, in over ninety per cent of all cases the patient will suffer from no unpleasant aftereffects.

Positive pressure, which consists in having the bag or bags holding the nitrous oxid gas and oxygen overdistended and the expiratory valve so regulated that an effort is necessary on the part of the patient to exhale, is indicated for the strong and robust. Valves are used for those below par, while for the very weak and anemic a somewhat open method is usually best.

Dr. S. Griffith Davis, of Baltimore, has supplemented my own work in the laboratory with warm anesthetics by a remarkable series of observations upon human subjects undergoing surgical operations. In twenty-six patients anesthetized with warm ether and chloroform vapor, the loss of temperature averaged 0.29° F., as against the loss of 1.02° in one hundred and forty cases anesthetized under similar conditions with the open drop method. This data in connection with the clinical effects observed daily by those using the warm vapors, places the vapor method upon a firm scientific basis.

The drop method[12] of ether or chloroform has no scientific basis of clinical facts to sustain it, when compared with the administration of the warm vapors combined with oxygen and passed through water, thus washing out the peroxids, aldehyds and alcohol, and giving to the patient a pure ether vapor. For this reason the statistics collected in recent years referring especially to chloroform should be accepted with very great caution. It has yet to be proven that any pathologic changes follow the administration of warm chloroform vapor with oxygen. The only method with which the vapor can be compared is the combination of nitrous oxid gas and oxygen. Having determined the safest way to administer the anesthetic, it is an easy matter to apply this knowledge so as to get the best results in any given case.

Of all serious surgical cases, the easiest from the anesthetic standpoint is a mastoid operation. A deep anesthesia is required only in the initial stages. The hammering and chiseling in itself seems to have some anesthetic effect, as the vapors can be almost withdrawn and the reflexes allowed to become quite active without the patient evincing any conscious movement. If nausea follows a mastoid operation, the anesthetist has not measured up to his opportunities.

For a submucous operation, the Rose position with warm chloroform vapor and oxygen is preferable when a general anesthetic is decided upon.

A recent visit to some of the principal medical centers in the United States shows a wide diversity of opinion both as to the anesthetic and the operation in the removal of adenoids and tonsils. In the Massachusetts General Hospital the prevailing method seems to be with the patient in the sitting posture. The patient is first anesthetized in the horizontal position, and is then picked up bodily and placed in an ordinary chair. The operator sits directly in front of the patient, with an assistant immediately behind him, while the anesthetist stands behind the patient, supporting the head and shoulders. As they have surgical chairs that can be thrown up instantly, to which the patient's shoulders can be strapped to prevent slipping when in the sitting position, there is no excuse for using this clumsy method. If the patient comes out sufficiently to annoy the surgeon, the anesthetic is reapplied and the operation continued. The nitrous oxid gas-ether sequence is used. (Chloroform is prohibited in this hospital.)

In Baltimore the horizontal position is used throughout. The nitrous oxid gas-ether sequence is used to get the patient under, and a continuous narcosis maintained by the warmed vapor method, using nasal tubes. The anesthesia is perfect, the operator taking his time, grasping with artery forceps and tying every bleeding point, as in an abdominal operation. Each case consumed between thirty and sixty minutes. Certainly no alarm from bleeding could be felt after the patient left the table.

In Cleveland, Ohio, all the cases that I saw were operated upon under nitrous oxid gas and oxygen alone. The anesthetic (given by Dr. Teter) was all that could be desired, the patient being completely anesthetized and all reflexes abolished. In order to maintain the anesthesia the gas and oxygen are forced through the nares under such pressure as to throw the blood from two to four feet. The surgeon in this instance seemed to be absolutely fearless to the possibilities of tuberculosis or syphilis, having only his glasses instead of some transparent shield to protect him.

In New York City, so far as I know, neither of these last two methods prevail. The usual procedure is to get the patient under narcosis with nitrous oxid gas or ethylchlorid followed by ether, using a closed method and getting the patient well under, and depending upon this first application of the anesthetic to complete the operation, or to reapply the anesthetic if necessary. In one clinic neither a local nor a general anesthetic is given the children. In St. Bartholomew's Clinic, with which I am connected, we use the nitrous oxid gas-ether sequence to get the patient under. The narcosis is maintained with ether vapor, supplemented by small amounts of chloroform vapor when necessary; all of the vapor passing through a tube soldered to the mouth gag. A water suction pump is used to keep the throat clear of blood. This combination gives a continuous narcosis and a bloodless field.[13] All operators using this method find their time diminished one-third to one-half, enabling them to get their maximum speed without feeling hurried. Every surgeon who competes for time against the anesthetic as usually given, and hurries through the operation regardless of the blood obscuring his view, cannot do his best work and will sooner or later come to grief.

In all operations upon the upper air passages a preliminary douching with some antiseptic (in some instances to clear the parts of blood and pus) is absolutely essential. The principal duties of the anesthetist are to find out whether the breathing is nasal or oral, and to direct his anesthetic vapor accordingly; to keep a clear airway either by a suction pump or sponging; maintain an even narcosis; keep the mouth gag in position; protect the patient from too much weight upon the throat and chest either by artery forceps, or by an assistant leaning too heavily upon the chest, and assist the surgeon in any way that he may direct. This is possible by the anesthetist using a foot pump, thus leaving both hands free.

While I have purposely avoided going into detail regarding any given method, and have refrained from the positive advocacy of any special procedure, this much may be said in favor of pulmonary anesthetics in general: the narcosis is always under control and may be modified according to the exigencies of the case. In the event of hemorrhage or shock the quantity of the anesthetic may be lessened, and the oxygen increased, thus keeping the pulse and respiration as nearly normal as possible. As the operation is drawing to a close, the pulmonary anesthetic should be so gradually withdrawn that the patient will be practically out of its influence by the time the operation is completed. If preliminary medication has been given, as suggested in this paper, and the head of the operating table raised, and this position maintained by two pillows under the patient's head immediately after the patient being returned to bed, a twilight slumber will continue until the patient awakens in a quiet and natural manner.

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9. Small physiologic doses of morphin and atropin alone.
(Morphin, grains ⅛ to ¼,
Atropin, grs. 1-200 to 1-50),
Or combined with chlorotone,
(Fifteen grains of chlorotone and one-quarter of a grain of morphin, should be the maximum dose.)

Or this latter alone, when morphin is contraindicated; the usual dose of chlorotone is 10 to 20 grains. Five grains every fifteen minutes until the patient shows effects of the drug, the last dose to be taken thirty minutes before the operation.

If morphin is to be combined, it should be given with the last dose of chlorotone. Chlorotone is both a local anesthetic and a general hypnotic. Dr. Swepson Brooks of St. Vincent's Retreat has been using it for the past five years in 15-grain doses, and repeating in 30 minutes if necessary. He considers it safer than hyoscin.

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LXVII.

NASAL ACCESSORY SINUSES—DIFFERENT METHODS OF TREATMENT.*

By Lee M. Hurd, M. D.,

New York City.

It is well to look at the etiology and pathology of nasal sinus diseases before considering their treatment. The usual cause of sinus trouble is a deformed middle turbinate, with which is frequently associated a septal deviation to that side, an enlarged ethmoidal bulla, or the uncinate process may crowd in upon the nasofrontal duct. Superimposed upon these abnormal anatomic conditions are the changes due to infection of the nasal mucosa which turn the naturally open sinuses into closed infected cavities.

The cases should be divided into acute and chronic, mild and severe. At times what appears to be a mild case may be the most menacing to the individual.

It is also necessary to make sure whether one is dealing with a purely acute condition or an acute exacerbation of a chronic inflammation. An acute exacerbation is far more dangerous than a simple acute inflammation. In December, 1906, I saw a boy 16 years old, whose only history was recurring frontal headaches for several years, to which little attention had been given. For one week he had had a nasal cold. The day I first saw him he had a chill, followed by a temperature of 105° F., pulse 135, with much frontal pain and tenderness. Examination of the nose revealed inflamed membrane about the nasofrontal duct, with some pus. Transillumination showed right frontal sinus light, left dark, both antra light. By shrinking the tissues with cocain and saline douches the temperature dropped to 99.8° by the next morning, but again reached 105° at 3:30 p. m.; at 11:30 p. m. temperature still 105°. I then removed part of the middle turbinate with considerable difficulty on account of a septal deviation, but could not get into the frontal sinus. However, I washed out a large ethmoidal cell and the temperature dropped to 103°, but the next morning it was climbing again--104°, continuing to 105°. I decided to open the sinus externally. He had a decided leucocytosis, 25,500, polymorphonuclears 81.6%. A Killian operation was done. The sinus was full of pus, under considerable pressure; the lining membrane was necrotic and easily lifted away from the bone. There was a large ethmoidal cell that occluded the nasofrontal duct, the same cell that I had washed out the night before and which had prevented my reaching the frontal sinus. It was three days before his temperature was normal. A case like this shows how suddenly a mild chronic affair can menace life.

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*Read at the thirtieth Annual Meeting of the Ontario Medical Association, May 31, 1911.

The acute inflammations, without complications, will usually recover under simple medical measures, attention to the bowels, diet and nasal douches plus at times a slight intranasal operation.

The chronic inflammations will generally require surgical measures, intranasal usually, in a few cases a more radical external procedure.

The complications of sinus disease will require sound surgical judgment and should be met promptly. If there is any doubt about what can be done intranasally, go in from the outside, where the opportunity to see what you are doing is the best and the diseased tissue can be the more thoroughly cleaned out.

Nasal sinus disease, especially chronic cases, quite frequently involves several contiguous sinuses; generally the ethmoidals are the first involved, then extending to the frontal, antrum or sphenoid.

Orbital and ocular complications are the more frequent. Meningeal and cerebral complications take place more frequently than was formerly supposed. Gastric and intestinal derangement is quite often associated, from the swallowing of pus. Acute otitis and mastoiditis at times derive their infection from the nasal sinuses.

This priority of the ethmoidal infection leads me to think that these cells are not always given the attention their importance demands. They extend frequently out over the orbit, where it is impossible to reach them through the anterior nares. In one case I found an anterior ethmoidal cell that extended fully an inch out over the orbit. This particular set of ethmoidal cells were accompanied by much frontal pain, tenderness and headaches with vertigo. There was a small amount of nasal purulent discharge. The eyes were normal. The middle turbinate and ethmoidal cells were removed as far as they could be seen, without relieving the symptoms. The external operation proved the frontal to be normal, but on reaching the ethmoidals this very large cell was discovered, which was filled with thickened membrane. All the ethmoidals and the anterior wall of the sphenoid sinus were removed. This resulted in the immediate relief of the headaches, and the vertigo disappeared in four weeks.

These cases that have the sinuses filled with very thick membrane are very obstinate to intranasal treatment. A case, to illustrate this condition, had ethmoid and frontal involvement. He had had recurrent nasal colds for over three years, with frontal and occipital headaches. The anterior end of the middle turbinate and some of the ethmoidal cells were removed two years before I saw him. He had gradually become worse, and was extremely nervous, feels mentally dull, lacks application, is easily fatigued and on the border of melancholia. The examination showed polypoid tissue about frontal duct with some pus. A probe could easily be passed into the frontal sinus, by which dead bone was detected on the posterior frontal wall at the frontal orifice of the duct. The X-ray showed a fairly large frontal sinus, which was very cloudy. A Killian was performed, but just before the operation, I, as I supposed, washed out the sinus through a canula, and to my surprise, when I removed the anterior frontal wall the pus and sinus membrane welled up into the wound under considerable pressure. When all the anterior wall was removed it was found that the canula had left a blood stained path through this thickened membrane, and the fluid from the douche had only followed the tract of the canula on its way out of the sinus and had not cleared out the pus or relieved the tension to any appreciable extent. This case shows how hopeless intranasal treatment is in this condition.

The antrum: acute inflammation. First determine the source of the infection, nasal or dental. The majority are nasal, dating from an attack of influenza or nasal cold. The dental cases are far more apt to be of a chronic nature. Though the transilluminating lamp will help in the diagnosis, a good X-ray plate is of far greater value. Suction with Bier's apparatus sometimes brings pus from under the middle turbinate near the antral orifice, which is a fairly sure indication of antral disease, but an antral trocar passed through the nasoantral wall under the inferior turbinate is the surest way of arriving at the diagnosis.

The acute cases will frequently clear up with repeated douching through an antral trocar. With a little care the original hole made by the trocar can be found daily and the antrum washed out without discomfort to the patient. If the purulent matter does not diminish daily under this treatment, it is only a waste of time to continue. Then the antrum should be opened into the nose by removing the anterior third of the inferior turbinate and then removing all the nasoantral wall up to the attachment of the inferior turbinate. This wall can be easily removed by first puncturing it with Myles' antral chisel, then the opening enlarged with punch forceps and Wagener's antral forceps, until all the antral wall is removed beneath the inferior turbinate. This procedure will cure most cases of antral disease, where it is alone infected. Do not expect it to clear up with either the ethmoidals or the frontal sinus above infected. There are a few antra that will not get well by intranasal treatment. Then it is necessary to do an external operation through the canine fossa. The incision runs along the gingivolabial fold from the canine tooth to the last molar. After retracting the periosteum, the whole anterior antral wall is removed, giving especial care to the corners; then all the lining membrane is curetted out until it is a clean bony cavity; next the bony nasal wall is carefully removed from the nasal mucosa, saving all the membrane possible. The inferior turbinate bone is also shelled out; this makes its membrane available. This nasal mucosa is used to make two or three flaps that will cover to the best advantage the antral walls. One of the flaps should be attached anteriorly in such a manner that it can be wrapped around the anterior rim of the opening into the nose to prevent exuberant granulations in this locality. By this method the nasal mucosa lines a good share of the antral cavity, and as the antrum now is simply a large recess of the nose, when healed, the patient can no longer suffer from antral disease, as this antral recess will hereafter be governed by the conditions of the nose alone. If the patient contracts a nasal cold the same condition pertains in the antral cavity, and when the cold clears up, the antrum does likewise.

The sphenoidal sinus, next to the antrum, gives the best results under intranasal treatment, though it is seldom alone infected. Most of the acute cases will recover under saline douches and injections of saturated argyrol solution into the sinus. If there is great pain, which is the case when the orifice closes, this pain being referred to the parietal, occipital or deep seated behind the eye, or there are ocular changes, free drainage must be immediately established. This can be done intranasally by removing part of the middle turbinate bone, resulting in a good view of the anterior sphenoidal wall. This wall can then be removed with biting forceps, which is as far as one should generally go, because the very thin walls of the sinus make it dangerous to use a curette. If it seems necessary to gain better drainage, use a dull forceps, grasping the thickened membrane and pulling it away carefully. It is only necessary to read one report of rupture of the cavernous sinus followed by death, from the use of the curette in the sphenoidal sinus, to approach this sinus ever after with the greatest caution. The sphenoidal sinus, in both acute and chronic conditions, is usually associated with a similar condition in the ethmoidal cells, especially the posterior group, and should be treated in conjunction with them.

The ethmoidal cells are probably the most frequently affected. The acute cases will usually recover under medical measures, though they may be very severe, as in influenza, with extension into the orbit, requiring immediate drainage, which is best done by the external route, where one can feel sure that it is all cleaned out.

This spring I saw a boy eight years old, who had had grippe three weeks before with some nasal symptoms. The day before I saw him his upper eyelid became edematous, with some frontal pain, much bone tenderness and considerable swelling and pus about the infundibulum. I opened the sinuses externally and found pus in the orbit just posterior to the lacrimal groove, where an anterior ethmoidal cell had ruptured. These cells, also the frontal, were severely infected, with pus under some pressure. The frontal sinus at this age is small and can be easily cleared out from below without removing the anterior wall.

Chronic ethmoiditis will rarely get well without the removal of the diseased tissue. These cases run the gamut from very mild infection, in which is produced the edematous nasal polyp (which, by the way, is probably always due to sinus disease), to bone necrosis. The mild conditions can be cured intranasally; the more severe ones depend largely on their anatomic features whether they will clear up with intranasal treatment. Here the X-ray plate is of great service. If it shows the ethmoidal labyrinth to be compact, with no extensions over the orbit, one ought to be able to reach all the cells through the nose, but if there are extensions of the cells out over the orbit the chances of an intranasal cure are not very good. Sometimes these cells extend an inch externally. The frequent association of frontal and sphenoidal sinusitis must be taken into account in the treatment.

In removing the ethmoidal labyrinth intranasally the whole middle turbinate should be taken out, then the diseased ethmoidal tissue removed carefully. As soon as the operative field becomes obscured with blood one should cease until it is controlled or wait until another day to finish.

The frontal sinus usually becomes infected on account of some deformity about the nasofrontal duct; the middle turbinate, the ethmoidal bulla or the uncinate process crowds in upon the nasal orifice of this duct so that if the nasal mucosa swells, the duct soon becomes narrowed or completely closed, converting the frontal sinus into a closed infected cavity, causing pressure symptoms. This condition in acute cases can usually be relieved by nasal saline douches and shrinking the nasal membrane with cocain and weak suprarenal solution. If these medical measures do not suffice, the anterior end of the middle turbinate should be removed. Bier's suction apparatus will aid in withdrawing the secretion from the sinus.

There is one class of cases worth bringing to your attention. It is the supraorbital neuralgias due to changes in the sinus secretion in which a very thick mucus is produced. This neuralgia is of a periodic type, starting at a certain hour each day, continuing for a certain time, then suddenly stopping, the patient feeling quite well the rest of the day. The period of the neuralgia is about the reverse to the usual frontal sinus pain, which starts as soon as the patient gets out of bed and lasts until the sinus has drained itself to some extent, which can be best illustrated by the following history: A man, 34 years old, of good habits, has had intense frontal neuralgia from 10 a. m. to 3 p. m. for two days. He gives a history of having a similar condition two years previously for six weeks, that came on at 10 a. m. and lasted a certain time each day; the pain was so intense that he became delirious. He was in a Mexican mining camp. At the time for the pain to come on he would lie down and endure it for several hours, becoming oblivious to his surroundings. It would stop at a certain hour, when he would proceed with his duties. On examination I found him extremely tender over the frontal sinus, the mucosa about the infundibulum was intensely congested, the least pressure in this region would increase the neuralgic pain. I observed this man go through his period of neuralgia for two days, and I do not remember seeing one suffer more intense pain. As I have said, it came on suddenly in an apparently healthy man, and he was completely incapacitated until the pain stopped, then he felt quite well again, considering the strain he had been through. I removed the anterior end of the middle turbinate and washed out a thick plug of mucus from the frontal sinus, when the neuralgia immediately disappeared not to return.

If there are orbital complications, such as edema of the lids, proptosis, etc., it is better judgment to open the sinus externally. I fully appreciate that some cases will be relieved by intranasal measures, but it is usually guesswork, and the infection may extend while you are temporizing. It might be well to add that orbital complications are comparatively rare.

The X-ray plate is of the greatest help in frontal sinusitis, especially in the treatment of the chronic conditions. Transillumination may be of some service, but should only be looked upon as one of the minor adjuncts for diagnosis.

In the chronic cases sometimes a clear history can be gotten where the condition started from an attack of influenza or a severe nasal cold; in others, no sudden onset can be traced.

The usual symptoms are bone tenderness, frontal pain, frontal headaches, indefinite sensations about the eye, vertigo and a discharge of pus from the nose. Purulent nasal discharge and tenderness are the two most frequent symptoms of which the patient complains.

The object sought is to establish drainage. This may be effected by simply removing the anterior end of the middle turbinate. It may also be necessary to take down some of the uncinate process and remove the anterior ethmoidal cells. Here the X-ray plate is of great service in determining how much can be done intranasally toward enlarging the nasofrontal duct. Where the plates show sufficient room between the nasal septum and the inner angle of the eye, and the side view shows a deep sinus, it is justifiable to enlarge the duct intranasally at the expense of its anterior and external walls. This should be done with great caution, using instruments that cut away from the brain. It is also well to leave some of the mucous membrane lining of the duct to prevent stricture later.

Mild cases can be irrigated with astringent solutions. Probably the best is zinc sulphocarbolate, as strong as the patient will tolerate, starting with twenty grains to the ounce; injections of saturated argyrol, freshly made, or silver nitrate from one per cent to saturated solution. I use the strong silver nitrate solution in old chronic cases where there is a moderate thickening of the membrane. Remembering that some individuals do not tolerate these strong solutions, I start with weaker ones and work up to 480 grains to the ounce. The sinus is first washed as clean as possible, then 10% solution of cocain is injected into the sinus, and when it is anesthetized inject the strong silver solution, flooding the nose at the same time with a solution of sodium chlorid so that as soon as the silver nitrate emerges from the sinus it is turned into sodium nitrate, which has no effect upon the nasal membrane. This method has given me some permanent results.

In cases where the discharge is more mucoid than purulent Beck's paste will give good results. It should be injected solid with the idea of filling the sinus cavity and creating some pressure on the thickened membrane, and the bismuth subnitrate acts as an antiseptic.

Bier's method of producing hyperemia by suction has much in its favor in conjunction with the above methods.

It is often asked: What proportion of sinus disease is amenable to these intranasal methods? From my experience, between 90 and 95 per cent can be relieved or cured. Shall we try intranasal treatment in all cases first? No. There are some cases in which it is very doubtful or hopeless to expect any results through the nose. Cases in which there are great pain and severe headaches, impaired health, neurosis, a productive inflammation in which the tissue is much firmer and more vascular than the ordinary polypoid tissue, orbital, ocular and cerebral complications, and some few patients that have not the time to spend trying the more conservative methods.

The external route holds many advantages and some disadvantages. Among the advantages are that one can directly see the anatomic and pathologic conditions and should be able to clear out all of the diseased tissue except in the sphenoid sinus. The cure is shortened from weeks to days and a recovery obtained in a larger proportion of the cases. Among the disadvantages are it submits your patient to the risk of a major opertion. (For instance, I had one patient die of ether pneumonia. This case showed at autopsy that the external and posterior bony walls of the sphenoidal sinus were softened and the dura adherent to them. What would have happened if the man had not died of pneumonia is impossible to say, but the operation should have been done months before.) There is likewise danger of diplopia and meningitis, also osteomyelitis. The last two I have never seen, though they are so formidable that their possibility should always be borne in mind. Diplopia means poor technic or carelessness. Deformity is due to the same causes as diplopia, except the cupping of the forehead from removal of the anterior frontal wall. This can be corrected with paraffin injection if the patient wishes, but I have yet to have a patient seriously object to this depression.

The Killian operation is the best suited and gives the best results as to cure of any operation devised to date. The two reasons for an external operation are best met by this method; that is, ability to see everywhere, especially where it is necessary to enter the ethmoidals and the sphenoidal sinus, and also to give the greatest amount of drainage into the nose with the least amount of disfigurement. Recently there has been some discussion about leaving the anterior frontal wall to prevent deformity. I am not ready to admit this is a good procedure, because if a small amount of mucous membrane is left in some pocket of the sinus, it will act as a cyst or point of infection. The safest way is to remove the anterior wall in the large sinuses; in the small ones it does not make any difference, as there will be little deformity, and if the anterior wall has been removed, you are absolutely sure the sinus is clean. Theoretically, there may be more danger in removing the anterior from osteomyelitis, but that is a point with which I have had no experience and I hope something practical may be brought out in the discussion.

A perfect cosmetic result can be obtained by attention to the minor details, such as crossmarking the line of incision before making the cut; then be careful and injure the orbicularis muscle as little as possible, never disturbing the periosteum over the arch of bone; do not mangle the edges of the wound in elevating the periosteum, and lastly, whether you use sutures or metal clips, take them off inside of twenty-four hours, and you will have a result of which you will not be ashamed.

15 East 48th Street.

LXVIII.

TREATMENT OF THE MASTOID WOUND FOLLOWING OPERATION.*

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The basis of the paper herewith presented consists of a series of two hundred cases which have come under my care at the Manhattan Eye, Ear and Throat Hospital and the New York Postgraduate Medical School and Hospital during the past five years.

The treatment of the wound following the mastoid operation does not seem to have received as large a share of consideration, at the hands of many writers on the subject of mastoid surgery, as it deserves, but has too often been considered as a routine matter, to be attended to by anyone who can pack gauze into a cavity.

Five principal methods are employed for dealing with the posterior incision.

First. Closure of the wound at the upper and lower extremity of the incision, leaving the central portion open for dressing.

Second. Leaving the wound open to allow granulation tissue to fill in the entire area.

Third. Suturing the flaps together throughout the length of the incision and trusting that nature will complete the healing satisfactorily by formation of a blood clot.

Fourth. Suturing the wound at its upper portion only.

Fifth. Closure of the wound, leaving drain in the lower portion.

While each of these methods has its advocates, the writer prefers the fourth method, which appears to him the most

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natural way: first, because the surgeon closes just so much of the wound as the case seems to require, leaving the lower portion of the wound open for dressing and drainage; and second, no pocket is left that might retain secretion, at the lower angle, and become a source of infection of the wound.

Whichever method is adopted, the wound is finally bandaged and the patient returned to bed to await the aftertreatment.

As much care should be exercised in having the dressings of the mastoid wound performed under antiseptic conditions as is used when performing the primary operation. It is therefore necessary that the surgeon have his hands and instruments sterilized when accomplishing this work. Indeed, if it were ever justifiable to be more careful in one case than in another, the performance of the dressing would call for the greater care, so far as asepsis is concerned, for before the operation is performed one has to deal with an area that is already infected and more or less occupied by pus; while at the time of dressing, one expects and ought to have a cavity free from infection, with healthy granulations endeavoring to establish themselves, that ought not to be infected by dirty hands or instruments.

Modifications of Technic.—The modification of technic in treatment of the mastoid wound has been very great. It is not a long time ago when at every dressing of the wound it was considered necessary to wash out the cavity thoroughly, and for this purpose the surgeon would take a large quantity, varying from a half pint to a quart, of solution of bichlorid of mercury, carbolic acid solution of varying strength, formalin solution, boiled water or normal saline, and with a syringe proceed to flush out every nook and crevice of the area that was struggling to put out new granulations, and after washing away all that he could of the healing covering that nature had thrown over the denuded area, he would proceed to fill the cavity with gauze of the strongest percentage of iodoform obtainable, and this method would be continued until dressings were no longer necessary, leaving a deep depression or ugly scar in nearly every case.

In this connection I quote from one of the leaders in mastoid surgery of the period just referred to: "Dust the cavity with iodoform, then fill the cavity with iodoform gauze, and cover the whole with a cushion of the same gauze and then put on the bandage. Remove the dressing on the day following the operation and give the excavation a thorough washing with warm bichlorid solution, and then lay a cushion of iodoform gauze over the region of the wound. Change the dressing and employ bichlorid injections either once or twice a day. I prefer twice daily until the fourth or fifth day; after this I make no further attempts to reach the antrum with the stream of bichlorid solution."

Only after dressing a series of cases using the old technic, and treating another series according to the more modern method—that may be styled the dry method—could the conclusion be reached that under the present dry method the new granulations are healthier and more firm, the wound heals more quickly and the minimum of scar results.

An Average Normal Case.—No exceptional change of temperature having occurred, the patient having good sleep at night, taking nourishment as he ought; only as moderate a degree of pain as might be expected; the original dressing is not disturbed before the fourth day, or frequently not until the fifth day following the operation, unless the operator has at his first dressing used rubber tissue as a lining membrane in the cavity for containing the gauze dressing, with the idea of making the first change of dressing more comfortable for his patient, in which case the whole dressing would be changed at the end of twenty-four or thirty hours.

We do not advocate the use of rubber tissue, believing that the simple fact of changing the dressing so soon after the operation is more annoying to the patient than the pain inflicted by removing the gauze, which by the fifth day is saturated with secretions and loosened from the walls of the wound sufficiently to prevent severe suffering.

First Change of Dressing.—On the fourth or fifth day the first change of dressing is made. After removing the outer covering, and before removing the gauze from the wound, the surrounding area should be thoroughly cleansed. This may be done in most cases by using a sponge of cotton moistened in sterile water. Sometimes when secretions adhere to the surrounding skin, peroxid of hydrogen may be used.

When the secretions become hard and form crusts on the surrounding surface, the above agents will not remove them without too much rubbing and irritation of the tissues. In such cases I know of nothing that acts so quickly and satisfactorily as spirits of turpentine, followed by alcohol.

How to Dress Wound.—The surrounding area thus cleansed, the gauze is withdrawn, the wound is gently mopped with sterile cotton on an applicator (the cotton soaked in 1-500 bichlorid, with the excess of bichlorid squeezed out), the new gauze inserted, and after this is done the sutures are removed. In a normal case when the gauze is first withdrawn, the wound appears comparatively dry, with its surface covered with a uniform layer of red granulations.

When the first dressing is inserted into the wound the operator presses it in with considerable firmness, to aid in preventing too much hemorrhage, as well as for drainage. Now that danger has passed, and we desire the new granulations to flourish, though not to be too prolific, hence the second dressing should be placed in the wound with only moderate firmness, and thus by the degree of pressure made by the gauze, regulate the prosperity of the new granulation tissue.

The subsequent dressings in a normal case should be changed every second day until the cavity becomes well filled in with new tissue, when the interval between the dressings may be lengthened, and now instead of continuing to fill the wound with gauze, pure boric acid is used, the cavity being filled with it, and covered by a light, superficial antiseptic dressing of plain gauze. This acid acts not only as an antiseptic dressing, but is an ideal drain.

The two conditions that would call for a change of dressing, different from that indicated, are: Pain, due to pressure or infected sutures, or cellulitis; and secondly, temperature. There is usually a rise in temperature twenty-four hours following a mastoid operation, but where there is a sudden rise to 103° or higher, with an abrupt fall to 98° within a few hours, and this change is repeated two or three times a day, infection of adjacent structures must be suspected and the wound examined.

Even though the case has been a normal one as regards the formation of the new granulation tissue, there is always a liability of a depression being left in the surface after healing is complete, due to the fact that when the mastoid cells have been removed there is no support left for holding the flaps up in position. The anterior flap, particularly, has a tendency to fall in against the posterior canal wall, and cicatricial tissue forming between this wall and the base of the anterior flap, draws the flap still more forcibly inward and forward, and with the new growth of epithelium, which begins at the skin edge of the flap, this surface (i. e., the anterior surface of the wound) soon becomes covered with epithelium and a great depression is the result. Such a misfortune may very often be prevented if at the first few dressings the surgeon adjusts the gauze so that the flap is pushed outward and up from the wound, thus preventing the raw surfaces from approaching each other; in fact, the gauze should be inserted in the entire wound in such a manner as to push both flaps outward and thus cause the edges of the flaps to remain separated. This will reduce the amount of depression left, and prevent the edges of the flaps from turning in toward the wound. This part of the dressing requires a great deal of care, otherwise the flaps being brought outward by insertion of too much gauze, will cause a gaping wound with the auricle extending out from the side of the head at almost a right angle.

If, when the first dressing is changed, and the drain is withdrawn from the external auditory canal, there is a discharge from the middle ear, this discharge should be cleaned away and the canal thoroughly cleansed by using a pledget of dry, sterile cotton on an applicator, and then after dusting the surface lightly with powdered boric acid, a strip of plain sterile gauze should be inserted, extending to the bottom of the canal, and so repeated with each dressing of the case until no more discharge is present.

There is a second reason, also, for inserting the gauze into the external auditory canal. Even though at the time of operation the posterior canal wall is not necrotic and none, or a very small part of it, is removed, there exists a tendency for the anterior flap, which forms a part of the posterior canal wall, to fall forward and carry with it the cartilaginous portion of the posterior wall of the external auditory canal, but where a portion of the bony posterior wall is necrotic, or has been removed en masse at the time of operation, the liability of this anterior displacement of the flap is very much greater, with the added calamity that a partial or complete atresia of the external auditory canal may follow. Therefore, in placing the gauze in the mastoid wound, the surgeon should be careful to not use so much pressure as to push the posterior cartilaginous wall forward, and in order to prevent whatever forward displacement might occur, a strip of gauze should be placed rather firmly in the auditory canal to thus preserve its normal caliber, as well as to act as a drain.

While the first object desired by inserting the gauze into the mastoid wound is to secure good drainage, the second, and almost equally important reason is, that the edges of the skin flaps may be held up and thus prevent a sulcus, and save the auditory canal from atresia. The books say the skin flaps should be kept widely separated, but this is not enough. If simply kept separated they will eventually turn in and thus increase the depth of the permanent depression. They should be kept separated, not by the gauze being placed between their edges from without, but by having the gauze so adjusted beneath them (i. e., from within) that it will push the flaps outward and upward, and thus separate their edges. Additional gauze will then be lightly placed over the entire wound as protection from infection and to complete the drainage, and not for the purpose of separation.

Obstacles to Healing.—In the process of healing every case does not run what we term a normal course. Certain obstacles to healing arise which cause the surgeon thought and worry. These may be enumerated as follows:

First. Delegating the work to an assistant.
Second. Infected sutures.
Third. Failure to include the periosteum in the suture.
Fourth. Failure to eradicate all diseased bone.
Fifth. A sinus.
Sixth. Removal of too much bone.
Seventh. Shock and low vitality.
Eighth. Adenoids and hypertrophied tonsils.
Ninth. Unhealthy granulation tissue.
Tenth. Cellulitis.
Eleventh. Anemia.
Twelfth. Diabetes.

Time and your patience will not allow speaking at length of all these obstacles to healing, though I assure you not enough attention is given to some of those conditions which, though seemingly insignificant, are of great importance.

After operating, it is so convenient for the surgeon to turn the case over to one of the internes for aftertreatment, and this course, which is too often followed, I believe is a mistake and often leads to a poor result.

Every young doctor who secures appointment on a hospital staff has not had opportunities for following up any cases similar to those which now come under his attention, and cannot reasonably be expected to know the best methods to pursue in caring for this class of cases. Other men, who pass good examinations and secure appointments, have not sufficient knowledge of aural surgery, and often lack practicability. The propriety, therefore, of delegating to an assistant the treatment following the mastoid operation, depends whether the assistant belongs to either of the classes just mentioned, or whether he is one of those well posted, practical men who has had enough experience to make him safe, and possesses sufficient good judgment to cause him to dress each case according to its particular requirements, for no two cases are alike.

Second. Failure to eradicate all diseased bone is an important obstacle, for not only does an area of necrosis that has been left prevent healing, but it almost invariably leads to the formation of the third obstacle, of which I will speak, namely, a sinus.

A sinus may persist passing through the aditus. This may be caused (a) by necrotic bone or tissue having been left in the aditus, or at the meeting of its posterior margin with the antrum. In every case the gauze used for dressing should be first made to enter this space, for unless this part is kept open and thoroughly drained until diseased products have all escaped and new granulations have filled in the passage from the anturm to the middle ear, a sinus is inevitable, which will give trouble in healing later, or may make a secondary operation necessary. It is important, therefore, that the gauze be inserted into the antral opening of the aditus, and as granulations spring up in this situation, filling in the cavity, the depth to which the gauze is carried becomes less and less at each succeeding dressing.

Such a sinus may be caused (b) by delayed resolution in the middle ear, because the operation has been too long delayed, thus permitting necrosis to extend to the structures of the tympanum, destroying the soft parts contained in the cavity and involving the incus in particular, though the whole chain of ossicles may be included in the process of destruction.

Where such a condition presents, though the posterior wound may apparently heal kindly, it will be only a short time ere the discharge again becomes free from the middle ear, through the external auditory canal, or the pus may make its way backward into the newly formed tissue and cause a breaking down of the entire area which had apparently healed, or it may burrow a sinus through the new tissue, opening itself in the post aural line of incision.

Treatment.—In this class of cases one may enlarge the opening of the sinus, and by a patient use of stimulating antiseptics (strong bichlorid, 1-500 on an applicator; nitrate of silver, 40 to 60 grains to the ounce, or a solution of formalin), both in the middle ear and in the sinus itself, together with careful drainage by gauze or boric acid powder in the sinus, secure a final, healthful closure of the wound in some cases. Where this result does not obtain in a reasonable time (one month), a cure can be effected only by performing a secondary operation; or it may be that a radical operation will be required.

Such a sinus may be produced by other causes. (c) There are three groups of cells which may be the source of this troublesome condition.

First. A group of cells occupying the posterior or middle zygomatic root, extending even into a portion of the temporal ridge, which, when present, are nearly always more or less involved in the necrotic process. These cells may be very extensive, and though much care may be required to secure their complete removal, lest the dura be injured or opened to infection by breaking into the middle fossa, unless their extinction be complete, a sinus with delayed healing is almost inevitable.

Second. That group of medullary spaces posterior to the sigmoid sinus, which may be easily passed by unobserved unless the operator is systematic in his operative technic, for oftentimes the cortex overlaying them is firm and of good color, yet the underlying cells share in the infective process and must necessarily be obliterated in order to be sure that no sinus, with subsequent infection, takes its source from that area.

Third. The lower part of the mastoid process, under the name of the "tip of the mastoid," where one large cell may exist or several smaller ones lie, and which almost invariably contains a good quantity of pus, the presence of which will certainly guarantee a sinus unless their complete removal is accomplished.

Treatment.—A sinus having its source in either of the areas just specified is due to dead bone, and will not be cured except by a thorough curetting. This should not be attempted by the use of cocain, for the pain is too great to allow the area to be curetted as thoroughly as it should be to warrant a cure. The patient should be anesthetized, and the operation conducted under thorough antiseptic conditions. The writer has a case under treatment at the time of this writing, who, after having the mastoid operation performed elsewhere, thought it did not heal quickly enough (eight weeks after operation) and made his way to the hospital. Examination of the wound showed a sinus one-eighth of an inch in diameter, leading from the antrum to the middle ear, filled with unhealthy granulations and a goodly amount of creamy pus.

The probe showed that the pus was coming from the cells in the posterior root of the zygoma, and the patient was advised to have this area curetted. He went back to the surgeon who performed the original operation, who did curette the part, but he attempted to do the operation under cocain, with the result that the operation was very incomplete on account of pain, and the patient made his way to the hospital again, where I found the pus manufactory "still doing business at the old stand."

These sinuses will not close until all of the necrotic bone is removed, and until this is done there is the constant danger to the patient of having the process of necrosis extend to the brain, or infect the tissues of the neck. After a thorough curettement has been done under anesthesia the treatment of the wound is the same as already specified for the original mastoid wound.

It sometimes happens that a sinus is formed because of what seems to be a development of unhealthful granulation tissue, and in which no area of dead bone can be detected. In such cases, which are few, a curettement followed by the use of one of the many antiseptic stimulating agents, $AgNO_3$, $CuSO_4$, or a solution of formalin poured into the unhealed tract, which is then completely filled with powdered boric acid, will quickly cause its closure, provided no dead bone is hidden somewhere beneath.

During the past year I have treated eight such cases, in four of which, when the stimulating fluid was poured into the sinus, behind the auricle, it ran through the middle ear and out of the external auditory meatus, and in one case the membrana tympani being intact, the solution entered the mouth through the eustachian tube.

Every one of these cases eventually healed completely, and when the external opening closed the whole tissue was firm and healthful.

Fourth Obstacle.—The removal of too much bone is a cause of delayed healing. The elements for the nutrition and repair of the bone exist in the nerves, lymphatics, arteries, veins and osteoblasts contained in the endosteum, and by so much as these elements are destroyed or removed, by so much is the repair delayed, impoverished or prevented.

The removal of too much bone is, therefore, a cause of slow healing and increases the liability of infection in the wound, and it ought always to be remembered that a poor supply of the elements named, not only reduces nutrition of the part, but invites the advance of bacterial growth and the delayed formation of granulation tissue. There is no advantage in securing a perfectly smooth surface so far as the process of repair is concerned, and it is well to remember that by the time so much bony structure has been removed as to leave a uniformly smooth surface, one has approached very near the dura, and thus in making a nice appearing wound, all smooth and shiny, the close approach to the dura has increased the liability to infection of the brain through the thin plate of bone that has been left, and has greatly reduced the power of repair in the bone, and by thus reducing the vitality of the bone, the power to form new granulation tissue is reduced, and frequently minute pieces of bone (sequestra) are thrown off and will be found in the dressing.

In fact, where it becomes necessary to remove so much of the bony structure as to leave merely a film of bone covering the dura, either over the sinus or over the middle fossa or cerebellum, I believe it hastens the growth of granulation tissue and causes the wound to heal more rapidly, to remove the bone entirely and allow the dura to be exposed, for it appears that when the bony structure covering the dura has been taken away until only a very thin layer of osseous tissue remains, the elements of nutrition have been so far destroyed that, though the bone survives, there is not enough circulation in the bone to produce granulation tissue, and thus healing is delayed and a sinus is sometimes formed in that way.

Fifth Obstacle.—Shock and low vitality. Some authors would lead one to believe that there is either no shock, or if any very little, to the person who undergoes a mastoid operation. I believe such an opinion is erroneous, and that shock following this operation is, in some cases, very great, while in others it is less, but in every case it is considerable.

The causes that have led up to the necessity for operation have been a more or less prolonged cause of lowering the vitality of the patient, as well as producing a complete loss of vitality in a large part of the mastoid bone.

This loss of vitality or diminution of the power of resistance renders shock to the patient more severe, and is an important obstacle to the process of repair.

The etiology of surgical shock has not been satisfactorily determined, but we know that the condition of the system prior to operation has a determining influence upon the character of the shock sustained.

In mastoid surgery, not often would shock occur from loss of blood, but vasomotor depression or nerve exhaustion may readily occur, and in the opinion of the writer does take place to a greater or less degree in every case.

The lowered vitality of the patient who suffers from a severe aural lesion is a factor in establishing a mastoiditis, and this condition, increased by operation, loss of blood and shock, is a great obstacle to satisfactory and prompt healing of the wound.

There can be no question that the reason for one case healing more quickly than another is due to difference in the tissues of different individuals, and that difference consists in the fact that one patient has more power of resistance than another, or more vitality, more life producing energy. It therefore is a most important matter that the condition of the system of the patient be looked after in an attempt to secure the best and most rapid result.

Tissues with low vascularity are notoriously slow in healing. The surgeon would therefore note whether the patient possesses the

Sixth Obstacle, Anemia.—Anemia as a systemic condition, or local anemia of the tissues surrounding the wound, caused by pressure from too tight bandaging.

If of the latter variety it is easily overcome by attention to the dressing, and seeing that the bandage is not applied with too much tension.

If the anemia is systemic, proper remedies and tonics should be at once brought into use.

In any attempt to secure a good result after operation, the resistance of the tissue of the individual must be considered. This resistance is due to several causes.

The blood serum is directly destructive to a number of organisms, and there is no doubt that the leucocytes play a most important part in destroying the bacteria, in preventing their absorption and in warding off their action from the surrounding tissue cells. Different patients have different degrees of susceptibility to the action of bacteria, and this is largely due to the difference in the destructive powers of their serum.

This constitutes the power of resistance, of which the anemic patient, and the run down patient, have but little, thus making the tonic treatment necessary.

The kind of food used by these patients is important in increasing the recuperative function. Private patients are usually able to get good, wholesome and digestible articles of diet, though they often do not live up to their ability in this particular and need advice most emphatically, while the average hospital patient, during most of his life at least, has been living on poor food, thus producing a body of low resistance, and in this class of patients it is a matter of the utmost importance to have them provided with food most nourishing, and that may be easily assimilated. In iron, arsenic and strychnin we have a combination of standard value.

For an immediate effect upon the anemia, I believe we have a most efficient remedy in nytroglycerin, gr. 1-200 four times a day to an average adult. For children, syr. of the chlorid of iron is palatable and very satisfactory.

Every aurist is familiar with the fact that aural inflammation is frequently caused by adenoid tissue in the nasopharynx and by diseased tonsils.

The same causes act in a similar manner to prevent healing, after the mastoid operation, and are too well understood to require repetition at this time. Masses of adenoid tissue and enlarged or diseased tonsils, as well as adhesions in the fossa of Rosenmüller, should be removed.

The part played in the act of healing by diabetes is too large to be considered properly in the limit of this paper, and should be carefully considered by the surgeon who undertakes the work of mastoid surgery, by familiarizing himself with the conditions produced in the system by this disease, and which have a marked influence upon the prognosis.

As in a person suffering from general anemia, any inflammatory condition will run a more severe course, so also in a diabetic subject an inflammation is more severe, and tends to assume a necrotic character and make the prognosis more grave. It is probable that in diabetes the germicidal power of the blood serum is greatly diminished, while sugar in the tissues is peculiarly stimulating to the growth of microorganisms; consequently, the poorly nourished and nonresisting tissues of a diabetic are unusually susceptible to microbe infiltration, and thus this disease becomes a weighty obstacle to the healing of the wound, and energetic treatment of the disease should be instituted at once.

Treatment.—The treatment of diabetes is too large a subject to be discussed here. Suffice it to say that the diet should of course be regulated as regards carbohydrates and fats. Food should not be withheld too strictly, as starvation favors the formation of poisonous acids. Excessive purgation should be avoided. Sodium bicarb. should be given in large doses (50 to 150 grams) until the urine becomes alkaline.

For the regular course of treatment the attendant should consult a good text book on this subject.

It remains to speak of the different varieties of granulation tissue that form to fill in the cavity of the mastoid wound.

Looking into a healthy wound one sees small, reddish elevations, usually covering a large part of the entire surface by the fourth or fifth day. The red color of these granulations is due to their great vascularity, and the presence in each granulation of a collection of newly formed capillaries, with more or less connective tissue, produces the irregularity of the whole surface.

Such granulation tissue exudes a serous fluid from its surface, consisting of serum, fibrin, leucocytes and red cells. Smooth, compact, reddish granulations are designated as "healthy" granulations.

In persons whose resistance is diminished by illness or other causes, the granulations may assume another type. In some cases the surface is very irregular, and the projections are soft and bleed upon the slightest touch, and are exceedingly sensitive.

To this form of granulation tissue the name "irritable" has been given, and as a rule it does not lead to prompt healing, but necessitates active treatment in order to secure a growth of normal type.

Treatment.—This form of granulation tissue should be curetted away and the cavity filled with iodoform gauze, inserted with a considerable degree of pressure, until the granulations take on a healthy growth.

Another form of granulation tissue differing from the normal, healthy type, is known as "exuberant" granulation tissue.

It is not reddish in color, but pale, soft and spongy, and shows an irregular surface with no firmness. The surface is covered with a yellowish, fibrinopurulent exudate, through which little reddish points project themselves, due to greater vascularity than the rest of the surrounding tissues.

This variety needs to be removed with a curette, after which the surface is painted with nitrate of silver, 360 grains to the ounce, and the wound then filled with plain sterile gauze, inserted with much pressure.

It will sometimes be found that the wound cavity fills in nicely with new tissue, and then at a certain stage, just before dermatization takes place, the granulations cease to grow and the exuberant type of granulation tissue begins to assert itself.

While nitrate of silver, either pure, as by the pencil, or in solution of 480 grains to the ounce of water, will reduce these granulations, it also produces a considerable amount of discharge and makes a sloughing surface. In these cases I have had excellent results by the application of Monsel's solution (liq. ferri subsulphatis).

Tubercular granulation tissue is pale, flabby and of the exuberant type, and when examined microscopically shows the characteristic lesions incited by the tubercle bacillus.

The regulation of pressure has little effect upon this variety. In one case, after the writer had failed to cause the wound to heal by the use of almost every known remedy, the granulations took on a healthy form and the wound closed very rapidly under dressing with gauze saturated with Koch's lymph. The more recent tuberculin has not proved of any special benefit in this class of cases. It is needless to add that patients of this kind require the best possible antitubercular treatment for their general condition.

In the syphilitic variety of granulation tissue we see a type that closely resembles normal healthy granulations, though of a slightly paler color and more flabby.

The microscope will show the characteristic lesions of the disease, viz.: areas of necrosis with a few giant cells scattered through the tissues; swelling of the endothelium of the capillaries, with a perivascular infiltration of the leucocytes, usually mononuclear in type.

Where this disease is suspected (and it ought always to be kept in mind) the patient should at once be put on antisyphilitic treatment.

From what has been said it will appear that the postoperative treatment of the mastoid wound is more than packing a cavity with gauze; that it requires a study of the case and good judgment as well as skillful care.

The time required for the wound to heal in a patient who, apart from the mastoid involvement is in good health, is about six weeks. Variations from this are usually caused by one or more of the foregoing obstacles to healing, and if these obstacles are prevented in the beginning, there will not be a very large number of cases that have a protracted period of convalescence.

Exceptions to this statement will be found among hospital clinic cases. Here we must labor at a disadvantage. A large percentage of the socalled clinic cases come from vile surroundings, having few, if any, of the ordinary comforts of life and living. Many of their houses are filthy, certainly very few know anything about surgical cleanliness, and a great number of them are poorly fed and have very low bodily resistance. We naturally expect such cases to require a much longer time to recover, and we are not often disappointed in this expectation. Eight weeks being a fair average, though in a certain number twelve weeks are required, due, undoubtedly, to the above causes.

The tubercular and syphilitic cases, and those in which streptococci are found in the blood, are the slowest in healing. I have the record of one case in which streptococci were abundant in the blood, and in which five months were necessary to produce a cure; while on the other hand there have been many cases in young, well nourished children, whose power of resistance was so good that they have secured a perfect cure in four weeks.

But the successful aftertreatment of the mastoid wound requires of the attendant more than the actual dressing of the wound and the prevention and overcoming of obstacles. He must be ever on the watch for any complications that may arise, principal among which may be mentioned extension of infection to the brain structures and meningitis, and thrombosis of the sigmoid sinus or internal jugular vein.

In this paper one cannot discuss these conditions, though it may not be out of place to say that where the temperature chart shows a sudden rise to 103° or more, with an equally abrupt fall to 98° or thereabouts, within a few hours, and this sudden variation repeats itself a number of times within twenty-four to thirty-six hours, a thrombus may be expected, and no time should be lost in investigating its cause.

If the meninges are involved, in addition to high temperature, 105°-106°, there will be headache, usually limited to one side of the head, which may at first be referred by the patient only to the region around the affected ear.

This pain usually, however, soon spreads over the whole head and keeps the patient in constant agony.

Photophobia is present in a majority of cases. The patient seeks a quiet place and moans or cries out when the pain is most severe.

In children delirium is not uncommon, and shrieking cries with an attempt to apparently exclaim something is common.

The neck muscles become rigid, the head is drawn backward and any motion or attempt to straighten the head on the neck is painful. In extreme cases opisthotonos is present, vomiting usual.

In many cases there is a choked disk, though there is much difference of opinion among different observers regarding this symptom, which depends on the location and extent of the lesion.

A blood count should always be made if any doubt still exists as to the presence of meningitis. Some of the spinal fluid (10-15 cc.) should be withdrawn and examined. If an amount of albumin exceeding 1 per cent is found, there is every reason to believe meningitis present, and the presence of pus and an increase of polymorphonuclear cells make the diagnosis positive. A blood culture, here, may be of the utmost advantage.

While the large majority of cases result in complete healing of the wound when the postoperative treatment is properly executed, following a complete operation, there remains a certain number of cases in which suppuration continues. Results already obtained by the use of autogenous vaccines and the Hiss extract of leucocytes, in cases where a suppurative process still persists, warrant their continued use and offer a broad field for conscientious, scientific work. For successful results in the use of vaccines it is necessary to isolate the causal organism, which is exceedingly difficult because most of the smears show mixed infection. Where the isolation can be effected the vaccine may be considered a specific. It is obvious that work along this line must be accomplished through the aid of a conscientious laboratory worker, and where so done the results are very satisfactory.

While the effect of the Hiss extract in the system is produced through an altogether different mode of action from the vaccines, its results in properly selected cases are almost marvelous. I cannot now enter into a discussion of these agents or their physiologic workings. I desire only to hold out some hope to those sufferers from chronic ear suppuration, who, unless properly advised, are doomed to spend their remaining years nursing a continuously discharging ear, which might have been cured.

In what has been said no reference has been made to the socalled radical operation. It remains, therefore, to consider the aftertreatment of this condition.

There seems to be some confusion as regards the names of these operations. While we would not detract from the honor of one who has given an advanced method to the profession, it appears to the writer that a better nomenclature has been adopted by some than that of calling an operation after the name of the surgeon who first proposes it.

The operation which exenterates the entire mastoid process has always been called the Schwartze operation. Similarly, the operation which removes the posterior canal wall and eradicates all disease from the antrum, aditus and middle ear has been designated as the Stacke operation; while that operation which removes all of the mastoid process, together with the posterior canal wall and the diseased tissue from the middle ear, is known as the Schwartze-Stacke operation.

While the Stacke operation is a radical operation, and in many of the text books is referred to as the radical operation, the true radical operation is the combined operation of Schwartze and Stacke, otherwise known as the Schwartze-Stacke operation.

It appears to the writer that all this confusion would be avoided if, instead of naming the operation after its originator, it were named with relation to the anatomic area in which it is performed. Thus: when the simple operation of removing all of the mastoid tissue is performed, it is called the mastoid operation. When the socalled radical operation is performed, which is done for the purpose of converting the antrum, aditus and middle ear into one cavity, it be called the antrotympanic operation; and when the combined operation of removing all of the mastoid bone, together with the posterior wall and the diseased contents of the middle ear is done, it be called the mastotympanic operation.

Under this method it would seem as though no confusion of names would exist.

In the treatment then of the wound after the mastotympanic or radical operation, one has to deal with a cavity that has to be drained and dressed through the external auditory canal. The posterior wound has been entirely closed; the cavity has been filled with iodoform gauze and the ordinary external dressing applied. This dressing is not changed until the third day, at which time the sutures of the posterior wound should be inspected, and if any inflammatory condition is present at the site of any suture, that suture should be removed at once. The gauze is withdrawn from the canal, care being taken not to disturb the flaps, which at this time are scarcely adherent to the bony wall of the wound. The cavity is now mopped out with dry sterile cotton, and is again filled with plain sterile gauze. On the fifth day this dressing is changed, the posterior wound should be entirely healed and the sutures removed; the gauze is withdrawn from the cavity through the external canal and now granulation tissue will be seen springing up over the wall of the cavity. Boric acid is now dusted over the entire area, and a pledget of sterile cotton formed into the shape of a cone is inserted through the external auditory canal, reaching to the bottom of the wound. From this time on the cavity should be gently mopped out with dry sterile cotton three times a day and the cone shaped piece of cotton inserted after each cleansing. The entire wound will be healed in from four to six weeks.

We regret that every case does not follow this ideal course. There are four areas which if not thoroughly curetted of all diseased tissue will prevent the wound from healing, and may make a secondary operation necessary. These are the cells of the posterior zygomatic root, the tympanic orifice of the eustachian tube, the attic, and that portion of the tympanum which is formed by the projection inward of the floor of the external auditory canal. Diseased tissue being left in any of these situations will necessitate a second curettement, which must be done under general anesthesia, in which case the aftertreatment would be carried out on the same lines as above indicated.

In cases in which the eustachian tube does not close, there will be a constant discharge from the ear and the cavity will not heal.

A plan that has worked well in the hands of the writer is, at the first two or three dressings, to insert into the opening of this tube (which was thoroughly curetted at time of operation) a strong solution (1 to 500) of bichlorid of mercury, which is done by means of a small pledget of cotton on an applicator. This seems to have a stimulating effect in causing healthful granulation tissue to spring up in this situation and close off the tube. In cases in which granulations are sluggish, balsam of Peru may be used with good effect; while if the granulation tissue is of the irritable, or exuberant type, it will be necessary to use a strong solution of nitrate of silver (360 grains to the ounce).

Where these attempts fail, a thorough curettement of the tube to the isthmus should be performed, the Yankauer curette being a very useful instrument for this purpose.

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LXIX.

INSERTION AND SEAT OF RHINOPHARYNGEAL FIBROMATA.*

By D. Jacques, M. D.,

France.

Considering the number of years that surgeons have been concerned with fibromata of the postnasal chamber, evoking study after study, it may seem superfluous to take up from a rhinologic standpoint a question which many regard as finally settled.

No one will deny, however, that the ablation of these tumors through the natural passage, whenever possible, has markedly improved their prognosis, and the accomplishment of this with safety has been due to the persevering efforts of specialists. To improve still further the technic of eradicating rhinopharyngeal fibromata, our efforts should be directed toward ascertaining their seat and attachments. On this point classic statements are, as we shall see, far from constantly corresponding with the facts.

At present it is customary to assume that rhinopharyngeal polyps are tumors with a pharyngeal seat, primarily arising from the basilar process in the roof of the cavum, and only secondarily pushing forward into the nasal cavity.

"These are tumors," says Morell-Mackenzie (1882) "of a fibrous structure, which generally arise from the vault of the pharynx, often extend into the nasal fossæ and even the antrum, or descend into the pharynx as far as the epiglottis."

"We fully accept," says Gerard-Marchand in Duplay and Reclus' treatise (1891), "the modern conclusion that while in the immense majority of cases rhinopharyngeal fibromata are inserted into the basilar area, they may also originate upon the posterior orifice of the nasal fossæ, on the internal wing of the pterygoid process."

***Report to the Third International Congress of Laryngology, Berlin, August, 1911.**

More recently still, Mickulicz, in Heymann's Manual of Rhinology and Laryngology (1899), formulates an analogous opinion. "They are tumors," says he, "which take their origin from the thick, fibrous, chondroid covering of the cranial base, and belong structurally to the group of fibromata. Their seat of election is the basilar portion of the occipital bone, which corresponds to the most anterior region of the rhinopharyngeal roof. More rarely fibrous masses of the same nature are seen in the neighborhood of the choanæ and in the sphenopalatine fossa. Still more exceptionally they are atatched to the anterior aspect of the first two vertebral bodies, which are covered with a similar fibrous layer."

I believe it is useless to multiply citations. The unanimous sentiment of general surgeons still rests today upon the assertions of Nelaton and his school (1850), corroborated by the anatomic observations of Tillaux. "The inferior surface of the basilar process is covered," says the latter, "with a fibrous layer of considerable thickness. Its form is triangular. Its apex lies between the basilar process and the odontoid process. Its base looks toward the pharynx cavity. Its width in the adult is about 18 mm.; height, about 27 mm. The importance of this fibrous tissue comes from the fact that it is nearly always the point of origin of rhinopharyngeal polyps, those singular tumors which have a marked predilection for the male sex and for adolescents."

In sum, until lately, the customary opinion in surgical pathology was that hard, bleeding polyps, with a large base, in the postnasal space, necessarily took origin in the strong ligaments which unite the occipital to the first cervical vertebræ. All other attachments were adventitious. The tumor, born in the epipharynx, only secondarily invaded the face cavities.

True, the exclusivism of this conception was tempered with some reservations on the part of a few operators. Without mentioning the cases of Robert, of Michaux (Louvain), in which they saw pharyngeal fibromata with a cervicorachidian insertion, it is fair to recall that Gosselin admitted that these tumors sometimes arose from the back part of the ethmoid, and belong then to nasal pathology. For him their place of origin went in all directions much beyond the basilar covering, which, however, remained the center of the territory.

Now in place of the classic idea of a basilar origin and primary pharyngeal seat for juvenile hemorrhagic fibromata, there has been for some years a tendency to substitute a new view, which I have endeavored to disseminate in various writings, namely, that of an ethmosphenoidal insertion and primary nasal seat of these neoplasms.

Without prejudging the operative and postmortem findings which should be determinative as a last resort, it is permissible to draw attention to certain clinical facts that are not harmonious with the generally accepted hypothesis.

On carefully reading again the published cases we notice constantly in the histories that one of the nasal fossæ is obstructed early, while respiratory embarrassment appears in the opposite side only at a relatively late stage of the trouble. Does an ordinary primary tumor of the epipharynx behave thus, for example a sarcoma of the pharyngeal tonsil, whose origin is exactly superposed upon the basilar fibrous coat? We know that in such a case the obstruction to respiration simultaneously involves both sides of the nose with a slight predominance on one or the other side, according to the case. On the other hand, experience teaches us that antral mucous polyps with a pharyngeal evolution produce a progressive nasal dyspnea successively upon the two sides, and not simultaneously, identical with the course observed in rhinopharyngeal fibroma.

Again, it is hard to understand how, on the hypothesis of a tumor originating from the roof of the cavum, there should be such a marked invasion of one of the nasal fossæ, and its upper annexes in particular, by a benign neoplasm whose weight ought to drag it downward into the free cavity of the pharyngeal tunnel. Above all, how shall we explain the perforations of the roof met with by many operators?

Such an evolution with such complications agrees admirably, we must confess, with the notion of fibrous proliferations implanted upon the upper wall of the nose. True, in the nasal portion of the cranial base there are no fibrocartilaginous layers comparable to those which cover the vertebral body of the occipital and upper spinal structures. But is such a layer necessary for fibromatous neoplasia, such as the narrow conception of Nelaton seems to demand? Do we not see fibrous tumors similar to rhinopharyngeal polyps, if not so vascular, arise from aponeuroses, from the periosteum, and even from the tegumentary connective tissue?

Further, fibromata of the nasal fossæ themselves have been noted and described by a number of authors. Morell Mackenzie has observed one indisputable case. I myself have recently observed two remarkable cases. One of these was a man beyond thirty. The growth had been present for six years, and only latterly had it invaded the cavum. It was inserted into the mesial aspect of the superior turbinal. The other was met with in a girl of eight. It started from the anterosuperior region of the ethmoid and had enlarged the glabella. In course of extirpation the rupture of a large cyst gave rise to a momentary suspicion of an unrecognized meningocele.

But before going further into the discussion, it is indispensable, I think, to state precisely what we understand by fibromata of the nose and pharynx. With the majority of authors I designate by this appellation tumors of generally firm consistence, usually tough, of fibroid texture, rich in vascular lacunæ, and having a thick, resistant pedicle directly attached to the bone. Development is slow and progressive; it leads at length to skeletal deformity by pressure. Histologically there is a hyperplasia of fibrous tissue with parallel fasciculi, generally poor in cells. Not rarely may be observed places of cellular proliferation with a sarcomatous appearance, or, again, foci of degeneration whose softening may end in the formation of cystic spaces, wholly different from those of true glandular cysts, of which mucous polyps furnish us such frequent examples. In places, also, may be seen connective fibers, dissociated by the edema, and on superficial examination resembling a simple irritative infiltration of the mucous chorion, analogous to that which gives rise to benign polyps.

These casual and partial analogies do not justify, to my mind, an association of true fibromata, the rhinopharyngeal polyps, with the diffuse hyperplasias, infiltrated with serum, which primary or secondary vasomotor disorders cause to arise in the mucosa of the ethmoidal region. These are hyperplasias which have been designated edematous fibromata after establishing the fact that they are myxomatous in appearance only. I differ, then, from Heymann (of Berlin) when he confounds in the same chapter of his Manual of Laryngology all the soft benign tumors of the nasal fossæ. I hold that there is room to distinguish clinically fibrous polyps or "rhinopharyngeal fibromata," from mucous and fibromucous polyps or "edematous fibromata."

Parenthetically, we must acknowledge that certain features attributed to rhinopharyngeal polyps by former writers are less absolute than is customary to admit, such as spontaneous hemorrhage, which may be lacking throughout, such as the narrow limitation of the 25th year for the period of accretion, and, finally, such as the exclusive predilection for the male sex.

A second point likewise demands precision. What is understood by "insertion" of rhinopharyngeal polyps? For a long time it has been observed that these tumors adhere to the walls of the face and neck cavities, not in one place only, but generally several places, which in a particular case justified employing the term, elsewhere abusive, of "polyps" as a designation. However, these multiple attachments are far from possessing the same significance. Some, variable in situation, are only adventitious, and result from secondary coalescence of surfaces eroded by reciprocal pressure. The others, much more fixed in situation, as we shall see, alone represent the primary insertion, the point of origin of the neoplasm. The extent varies in both, but the degree of resistance is quite characteristic in each class. The secondary adhesions scrape off easily with the nail or spatula from the subjacent tissue, especially from bone. Such detachment is impossible at the true pedicle, whose eradication inevitably brings with it osseous particles or even entire lamellæ of the compact substance. This is the pedicle in question when we discuss the insertion of rhinopharyngeal polyps.

Let us see now what a careful study of these facts teaches us:

About fifteen years ago I begged my colleague and friend, Prof. Moure, to operate by the natural passages upon a boy treated for several months in my clinic by electrolysis for a typical rhinopharyngeal polyp provoking copious hemorrhages. The operation revealed that the pedicle of the tumor went up into the right nasal fossa and was fixed in the sphenoid region. Moure, on that occasion, gave out the opinion that juvenile fibromata of the cranial base arose more often from the border of the nasal and pharyngeal cavities than from the roof of the cavum, an opinion which he affirmed the following year at the French Society of Laryngology, elaborated later in the theses of his pupils, Latour (1901), Gautier (1904) and Duverger (1905).

Struck with the contradiction of the classic theory by my patient, I resolved to try to determine as exactly as possible the manner and place of insertion of rhinopharyngeal polyps which might come to my hands for operation. In May, 1908, I was able to present to the French Laryngologic Society six cases personally operated upon and cured. In all my patients the principal attachment was upon the anterior aspect of the sphenoid body, and extended more or less toward the root of the internal wing of the pterygoid apophysis, without involving in any way the body of the occipital. During the discussion of my paper a number of French and foreign special surgeons gave the support of their experience to the theory which I maintained (Moure, Beco, Lafitte-Dupont, Texier, Raoult, Castex). It was different at the French Surgical Society the same year, where I raised the question in answering an important paper presented the year previous by Prof. Tedenat of Montpellier. This author, out of 32 cases observed or operated on by him, in 26 found the insertion exclusively basilar; in 4 the place of attachment could not be exactly determined, and in the 2 others the tumor was fixed to the vomer and root of the pterygoid. Admitting the fewness of the cases personally observed, but carefully studied and all entirely concordant, I feel a right to conclude that the basilar insertion has at least frequent exceptions, that there is ground for inquiring if the classic notion did not originate from cases seen under especially unfavorable conditions, and that the theory of rhinologists who, along with Capart, Moure, Apert, Escat and Broeckaert, localize the pedicle to the sphenoid, does not contain more of truth.

It does not appear that my arguments sensibly affected the Nelaton theory in the minds of the general surgeons, judging by the discussion which took place two years later in the same society over a report by Prof. Rouvillois, of Val de Grace. This was an interesting case in a young soldier who recently died in his care, following repeated hemorrhages from a pharyngeal fibroma. Autopsy showed that the insertion of the polyp was upon the anterior aspect of the sphenoid body, encroaching somewhat interiorly upon the vomer and laterally upon the root of the pterygoid. The floor of the sphenoid antrum was destroyed and an intrasphenoidal lobule of the growth adhered to the internal border of the excavation. The basilar process was entirely exempt.

Responding to this suggestive contribution, Prof. Kirmisson conceded that rhinopharyngeal fibromata, beside their basilar insertion, may extend their attachment to the border of the choanæ. It is seen that the dogma of a basilar origin for juvenile fibromata remains untenable. I also deemed it well to publish last year two new cases of mine, completely according with the others, making eight cases with eight sphenoidal insertions and no basilar insertion. This, it must be agreed, is something more than a fortunate coincidence.

Meantime (1909) Escat has brought to the support of my assertion a case observed by him from 1898 on, of a purely nasal fibroma, operated upon per vias naturales, which recurred at its pedicle, inserted in the posterior part of the nasal roof, and subsequently evolved into a typical rhinopharyngeal polyp which caused death by hemorrhage.

Since then Prof. Sieur (paper) and Prof. Gaudin (oral) have aided in confirming my theory by their personal statistics.

Let us sum up briefly the facts in this short discussion of the anatomic origin of rhinopharyngeal polyps.

The great majority of general surgeons at present still hold to the old doctrine based upon the teachings of Nelaton and his school, that the site of election of rhinopharyngeal polyps is the vault of the pharynx between the tubercle of the atlas and the beak of the sphenoid. They arise from the fibrous tissue which covers the basilar process in that region, and upon which rests the pharyngeal tonsil. Hence they are primarily pharyngeal tumors, but they may secondarily invade the nasal fossæ and their sinuses. Exceptionally their insertion may exceed the limits of the basilar coat, and descend to the bodies of the first cervical vertebræ, or advance upon the pterygoid, the choanal arch, or the vomer. Lastly, there is an extrapharyngeal variety (extra cavital) which originates in the fibrocartilaginous tissue of the irregular anterior opening (Bensch) and develops in the soft parts of the pterygomaxillary fossa.

During the past decade, in the rhinologic world, minute clinical and operative investigations have developed an opinion decidedly divergent from the old conception, big with operative importance, if not appreciable pathogenic deductions —rhinopharyngeal fibromata are tumors originating in the nasal fossæ, only invading the cavum after acquiring some size, and comporting themselves, as a whole, relative to their evolution, in a manner absolutely identical with that which we are accustomed to see in socalled "fibromucous" or "choanal" polyps. They arise from the most posterior portion of the middle meatus, and, dragged down by their weight, descend into the epipharynx, obstructing the choanæ successively, and sending digitations forward which fill the meatus of the corresponding nasal fossa. However, being less plastic than the other sort, rhinopharyngeal fibromata soon deform the wall of their originating cavity by a process of erosion from compression. Further, we see the vomer, its rear portion pushed toward the healthy side, thinned at its interchoanal border. The same is true of the sinus-nasal partition, which is thinned or destroyed, giving way to the continuous push of the neoplasm, which fills most of the pneumatic spaces of the affected side, by moulding itself into their irregularities.

From my personal investigations, in accord with numerous observations by rhinologists, it follows that the insertion is ordinarily a thick fold of tough tissue, with parallel fibers in the most posterior part of the nasal roof. The point most commonly involved seems to be the anterior surface of the sphenoid body, and more particularly the sphenoethmoidal recess. From this central point attachments may radiate to the upper choanal arch, the base of the vomer and pterygoid, the fossa of Rosenmueller (Moure), the posterior ethmoid, the sphenoid antrum and even the maxillary sinus.

Diverticular expansions of the growth are the rule; the most important and most constant being into the sphenoid cavity, which it sometimes considerably distends to a size equal to that of the intranasal lobe. The fact is easy to understand when we know the close connection of the fibroma with the sphenoid body. The posterior ethmoid cells are invaded with almost equal frequency, and imprint their septa upon the external surface of the polyp, giving it a lobulated aspect. The maxillary antrum also often conceals a voluminous prolongation whose entrance seems to be through the broken-down posterior part of the ethmoid, rather than through a dilated accessory hiatus. The anterior ethmoid cells are less often attacked, and the frontal sinus usually escapes invasion.

Extranasal prolongations enter either the cranial cavity through the destroyed nasal roof, or the orbit through the resorbed papyraceous lamina, or the zygomatic and temporal fossæ, creeping through the distended sphenopalatine foramen (personal case).

Secondary adhesions may occur at any points where the growth touches a resisting wall; they are met with especially on the vomer portion of the septum.

Finally, as regards the seat of rhinopharyngeal fibromata, I have noted their marked predilection for the left side, a fact pointed out by divers authors, and especially by Escat, whose statistics entirely confirm my own (7 left sided cases, 1 right).

If the rhinologic cases favoring a sphenoidal origin of rhinopharyngeal polyps are at present sufficiently numerous and concordant to enforce conviction, the basilar origin is still firmly supported in the minds of general surgeons, by even more numerous reports and just as categorical. Now, the question of singular coincidence, of a fortuitous series, could not be invoked to reconcile these two distinct views. So I am tempted to explain the divergence by erroneous interpretation on the part of the older writers. How much is explained by the difficulty of confirming with precision the exact attachment of a tumor which at once fills the pharynx, the nose and its annexes, after distending them, deforming the cavity and dislocating the walls? How can we determine the true pedicle in the midst of adventitious adhesions, often extensive, in the depths of an operative cavity flowing with blood from the operation wound as well as the tumor itself? We should not forget that the cases reported by the surgeons were diagnosed late in an advanced stage, and extirpated, as Kirmisson says, by operators "desirous above all of acting quickly, operating under chloroform, tearing, curetting and cauterizing in a bloody field."

And, speaking of the easy confusion in recognizing the point of attachment, I myself have been a victim. In the course of one of my operations I got the impression for a moment that fixation of the neoplasm extended to the roof of the cavum;

an illusion caused by enormous enlargement of the left choana, hindering both finger and eye from exactly finding the limits of the nose and pharynx. Whatever skill one may have in rhinoscopy, it is sometimes singularly hard to orient oneself in a region so greatly changed by erosion and displacement of the vomer, lowering of the pharyngeal roof, distension of the choana, with atrophy and flattening of the turbinates, effacing gradually the demarcation between the nasal fossa and the pharynx cavity.

In the presence of this incertitude, finding the pharyngeal tonsil intact, which is easily recognizable in the young, furnishes high testimony that the subjacent basilar covering is a stranger to fibroma. By observing integrity of Luschka's tonsil I was able to enlighten myself in a case where the roof of the cavum, lowered by a large intrasphenoidal prolongation, at first caused me to regard it as the tumor itself extending down the posterior wall of the pharynx.

I believe, then, that contrary to the classic notion, the point of origin of rhinopharyngeal polyps should usually be sought for about the posterior recess of the nasal roof, and that only exceptionally their attachments go back of the choanal plane and extend onto the basilar process of the occipital. Contrary affirmations no doubt rest upon errors of judgment or observation.

Besides the array of material facts, the theory I hold would be greatly strengthened if these facts could be connected with some special anatomic peculiarity of the region involved, thus explaining the singular predilection of hemorrhagic fibromata for it. But, up to the present at least, no such peculiarity has been found which does not apply equally to the basilar region.

Rhinopharyngeal fibromata, to my mind, are only simple irritative proliferations of accidental cause, like mucous polyps. Their tendency to recurrence and to penetration of surrounding regions ought to class them among the tumors proper, while the constant absence of generalization separates them distinctly from the cancer group. They present themselves, then, as a result of a metabolic superactivity of part of the bony cranial base in the course of its normal period of rapid evolution. Why does this excessive superactivity of the periosteum prefer the sphenoid body to the body of the occipital? Bensch contents himself with saying that for unknown reasons, a circumscribed region of the cranial base, prevented from making bone tissue, vents its formative activity by producing fibrous tissue. This proposition is more acceptable, to my mind, with its vagueness, than the seductive and precise theory of Tillaux concerning the occipitorachidian network.

I do not know how many other explanations for the pathogeny of rhinopharyngeal polyps have been advanced. Dr. Delsaux has acquainted me with an original conception in a report, as yet unpublished, to the Belgian Laryngologic Society. According to him the term "rhinopharyngeal polyp" covers a multitude of tumors that are different histologically and different in their malignity and course. They doubtless take origin in various tissues, epithelial or connective tissue remnants establishing temporarily, in the course of embryonal development, communications between the cephalic intestine and the cranial cavity across the vault of the pharynx.

It would be desirable if our histopathologic knowledge were better supported in respect to these neoplasms, and no doubt a methodical effort in that direction would dispel much obscurity and theoretical discussion. I would object, however, to my colleague's view, by saying that the "communications" he speaks of are doubtful, except Rathke's diverticulum, which, contrary to Romiti's opinion, seems rather should be localized between the two sphenoids and not in the pharyngeal fossa of the occipital. In any event, the frankly lateralized beginning of juvenile nasal fibroma seems to me to set aside in most cases the hypothesis of embryonal origin from diverticula.

Still, the course of these peculiar tumors agrees very well with the notion of an exaggerated accidental proliferation during adolescence, of a connective tissue mass precisely localized, probably the periosteum of this curious region about the cranial base, which corresponds to the anterior extremity of the notochord, and marks the limit between the primitive base of the membranous skull (sphenooccipital portion) and the superadded part, following the progressive incurvation of the cephalic end of the cerebral vesicle envelopes (ethmoid portion).

If we follow the fetal development of the limited region which, in the embryo, on the brain side, contains Rathke's median cranial pillar, and on the intestinal side the hypophysal pharyngeal diverticulum, we recognize that it corresponds to the junction of the bony outlines of the two sphenoids to the basal cartilaginous plaque. There converge from each side the two ossification centers of the presphenoid and the five centers of the basisphenoid. There persists on the ventral side, between the sphenoids which are fused above, a fibrocartilaginous mass which disappears only after birth.

To conclude from this simple fact that there is a pathogenic relation would be to exceed our information. Only from anatomic and anatomopathologic research in the future can we expect explanation and confirmation of the condition to which I am content to direct attention, by reason of its immediate practical interest, that is to say:

The fibrous tumors of adolescence known as rhinopharyngeal polyps usually have their origin in the rearmost part of the nasal roof and not the roof of the cavum. They are inserted principally upon the anterior surface of the sphenoid body, and not upon the basilar coverings. They early invade the nasal annexes and particularly the sphenoid sinus, before involving the epipharynx.

LXX.

CONSERVATIVE RADICAL OPERATION ON THE MIDDLE EAR.*

By Dr. Stacke,

Erfurt, Germany.

By the term "conservative radical operation" is understood the radical laying bare of the middle ear space, with the preservation of as much as possible of the tympanic membrane and ossicles.

I wish to bring to your attention certain points of view which I do not find mentioned in literature, but to which I have devoted my attention for the last sixteen years. Panse, Scheibe, and Jansen appear to be the first who, early in the nineties, soon after the introduction of the radical operation, made any attempt to preserve the ossicles in this operation. I myself in 1897 recommended their preservation, and later Siebenmann several times recommended the preservation of the ossicles. We have not yet, however, fully determined under what circumstances the ossicles should be preserved in the radical operation, and when they should not. Cases are described with perforations in Schrapnel's membrane, and with very varying perforations in the pars tensa of the tympanic membrane, and cases with well-preserved and with very poor hearing.

There are also many methods of operation which are recommended. Most authors leave a portion of the bony ring in order to give the drum membrane a point of attachment. Others recommend protection of the lateral wall of the attic, or say not to open the aditus, or only so far that the insertion of drum membrane still remains. Yet others recommend opening of the antrum from the external canal only. All

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***Translated by Miss Rebecca Cooke. Edited and somewhat abridged by Geo. L. Richards, M. D., from the Deutsche medizinische Wochenschrift, August, 1911.**

authors are, however, in unison in proposing that the auditory ossicular chain be kept intact in its continuity, so as to obtain the most hearing possible. Many consider the breaking of the ossicular chain at the long process of the anvil, as well as disease or absence of the anvil itself, a contraindication for the operation, with the idea that after the breaking of the union between the anvil and the attic, the preservation of the other ossicles is of no more value. Few authors pay much attention to the condition of the tympanic membrane and the tympanic cavity. Others are opposed to the preservation of the chain of ossicles and their remains, and in general to any efforts supposed to be conservative. In short, up to the present time, there appears to be no unified point of view or strict indications, and the question is left in great part in doubt or undecided concerning the value or lack of value of the radical operation.

Such being the case, I desire to urge upon my colleagues some agreement in regard to this question, and am therefore bringing before you my experiences in this department of otologic surgery. My material comprises fifty-one cases, taken from private practice, all of which have been cured with the exception of five cases, which are still under treatment. These cases not being clinic cases have been observed from the beginning to the end of the treatment, and I am still able to see them at longer or shorter intervals of time. I endeavor in all cases to preserve the tympanic cavity, approaching as far as possible to the normal, keeping it entirely closed toward the external canal, and have selected my cases with this point in view.

Improvement of hearing and the preservation of the tympanic cavity is the goal which I attempt to attain in all of my cases. This presupposes a definite indication, and also a definite, well-determined anatomic condition as an absolute necessity. I save the tympanic membrane and the auditory ossicles, preserving the pars tensa of the tympanic membrane and completely closing off the tympanum. Bondy comes the nearest to my point of view. In 1909 he reported four cases in which he preserved a very good hearing power. In one of these cases, however, the tympanum was not closed off.

My first case was reported in 1895, and was published in 1897. In the same year I reported the precise indication for the operation. I have not used the conservative treatment in old, chronic perforations of the pars tensa, because I consider it less promising in these cases, and for the most part contraindicated.

The characteristic findings in the attic, aditus and antrum, which are indications for the operation, may be divided into three groups. First, fistula lying high up in Schrapnel's membrane, either in front of, above or behind the short process of the hammer, as well as into the fistula, or greater or less destruction of the lateral attic wall. Second, pathologic separation of the drum membrane behind and above, with secondary adhesion of its border, and attachment to the surface of the labyrinth wall or the wall of the aditus underneath the prominence of the facial. Third, the much more seldom perforation of the floor of the antrum at the side of the aditus into the posterior superior bony portion of the external canal. In these three groups of otologic conditions, it being assumed that the tympanic membrane is present, one finds almost without exception complete closure of the tympanum. The air douche through the catheter results in no perforation noises, while the normal bubble noise is the surest evidence that the tympanum communicates only with the eustachian tube, and is closed on all other sides from any cholesteatoma or suppurative focus in the accessory cavities. Such a tympanum does not suppurate, perhaps has never suppurated. Our present theory in regard to cholesteatoma coincides with this supposition.

Bezold has already stated that without previous suppuration, and following chronic exudation, there can be atrophy of the tympanic membrane and closure to the tube, with the result that Schrapnel's membrane can be finally worn away and the ingrowing of epithelium into the attic space made possible. Witmaak also states the origin of cholesteatoma in a similar way. I was previously a skeptic in regard to this theory, but certain experiences have convinced me of the possibility of its occurrence. Isolated acute suppuration of the attic, if neglected, may also bring about the same condition. It can be stated that we all knew about these conditions long ago, but that they are seldom found among the great mass of cases requiring the radical operation. That I formerly believed, but if one pays especial attention to these forms one will be continually astonished with the frequency with which they are to be found.

During the last ten years I have systematically studied these cases, but, unfortunately, have neglected during all the years to make statistical notations concerning the frequency of these conditions in comparison with the number of radical operations. During the last three years I have made incomplete notations, and have found that, excluding cases with intracranial and difficult complications, among sixty uncomplicated radical operations there were thirty which presented one of the three conditions above described, with closure of the tympanum, and so could be conservatively operated upon; that is, fifty per cent.

It may be accidental or unusual that these cases have been so often met with by me during the last few years, but if it should be proven that over a longer period of time the percentage of these cases has to be changed somewhat to their disadvantage, I nevertheless believe that a considerable proportion of cases will remain where patients with closed tympanic cavities can be radically operated upon, and cured, with the tympanic cavities still closed. A more ideal cure cannot be brought about. Complete epithelization of the antrum, aditus, and attic, with preservation of the tympanic membrane, normal sometimes, in others somewhat lessened in size, but with the tympanic cavity closed toward the outside. Under these circumstances, the much-to-be-feared recurrence of the tubotympanic suppuration is prevented. Where under other conditions the purulent process would be started up again, here there is only the exudation, which after breaking through the drum membrane becomes absorbed. When one thinks how much labor it often causes to get the freely opened purulent tympanic cavity dry, and what expense of labor is necessary to skillfully close the tympanic end of the eustachian tube, it is easy to understand how much the closed tympanum is worth in the radical operation, and will never fail to make use of this advantage.

In all of my fifty-one cases a lasting closure of the tympanum was obtained in all but one. When I put the closure of the tympanic cavity as of the first importance, as an end worth striving for, I do not leave out of consideration the point of view that the power of hearing is to be improved as much as possible. Both things occur simultaneously in many cases.

Disagreeing with Bondy, Barany, Urbantschitsch and others, I found the power of hearing often very well preserved, either quite or almost the same as normal. This power of hearing remains in my cases, as in those of the authors mentioned. We do not need any more to be afraid to operate radically on an ear with a good degree of hearing, provided the above conditions are present, even though it is the only one that has good hearing. I emphasized this in Hamburg in 1899, when Reinhard was afraid to operate on a case of cholesteatoma with a fistula high up, and with otherwise intact tympanic membrane, because he feared that the hearing power, which was good, might suffer through an excision of the ossicles. This fear was quite proper, since all authors agree that in such a case by excision of the ossicles one risks a very considerable loss of hearing, not to mention that the formerly sound tympanum may be involved in the suppurative process.

On the other hand, I have usually found very little improvement in hearing when it was already very bad, that is, cases where a whisper is heard only in the immediate neighborhood of the ear. Here excision of the ossicles usually improves the hearing only a little, or not at all. Even supposing there was a little improvement after ossiculectomy, I would not excise the ossicles, but would preserve them with the tympanic membrane. Five times I have seen an improvement in hearing from one-quarter meter to one meter, or one and one-half meters, and four times from one-quarter meter to four meters. With moderate hearing power I have known and have achieved decided improvement, but this cannot be with certainty reckoned upon.

The results of ossiculectomy are also entirely uncertain. Loss of hearing can follow this operation also. The conservative operation loss is less likely to occur. As a rule one has at least as good hearing as existed before the operation. I have, however, in two cases with moderate hearing, seen a loss of from three meters to one meter, and from four meters to two meters. Here I ascribed the blame to the faulty omission of catheterization at the right moment after the operation. I lay great value upon this. One of these cases finally had chronic nephritis. In cases of moderate hearing

I have seen decided improvement in ten cases, the hearing distance increasing from one and one-half meters to five meters, from one-half to six meters, from three to seven meters, from three-quarters to three, from one to two meters and the like. Not counting any improvement of less than one-half meter, on account of possible mistakes in testing, my results show in twenty improvement, in two cases loss, in twenty-four cases unchanged hearing distance, and five cases are not yet completed. The prospects then for hearing by the conservative method are certainly not worse than by excision, and probably considerably better. The great advantage of the conservative operation is that we have destroyed nothing, and that excision of the ossicles is still open to us after the result in healing of the suppurative process. There is also the chance that the tympanic membrane may regenerate after ossiculectomy.

In every case where there is good, fair or even bad hearing, I consider the conservative method, as compared with ossiculectomy, as superior, provided that the tympanic membrane and the tympanic cavity are preserved.

The obtaining of a closed tympanum depends entirely upon the operative technic. If one allows the bony ring to remain, one cannot depend upon the closing off of the tympanum. I never allow any of the annulus (ring) to remain. My method of operation, which I have used without exception from the first to the last case, differs not at all from that which I have stated to be necessary for all cases to be operated upon radically. After laying bare the external ear and the external canal, the socalled first part of the operation, I search for the fistula over the pars tensa of the drum membrane, and successively open all the neighboring spaces, the attic, aditus and antrum. I cut away then the entire bony covering of the antrum, leaving it widely open, exactly as I have previously written, so that every space is widely open outwardly, as in every radical operation. The external canal plastic I make also in the same manner as previously described, so that we have the widest possible opening.

By this means I protect most carefully the ossicles and the tympanic membrane. Bondy comes the nearest to me in the method of operating, although he does it in a reverse way. If I have understood him correctly, he allows no bridges or bony borders to remain. In some cases where the fistula lies behind the short process, I allow the anterior part of the outer attic wall to remain. In such a way, however, that the head of the malleus remains visible. Usually I remove the attic wall as widely as possible, opening the aditus in the same way, and sloping the back wall of the auditory canal down to the plane of the facial nerve. I disturb the ossicles as little as possible, even when, as is usually the case, they are covered more or less with granulations. Either the granulations shrink of themselves in the course of the after-treatment or through cauterization, the use of silver nitrate or chromic acid. Even carious places heal perfectly after the operation. By this method of not disturbing the ossicles, defects in the long process of the incus remain undisturbed. In cases where the tympanic membrane is found loosened behind and above, and has already found a new insertion medially, and has become in part attached to the wall at the point of perforation, the tympanum is frequently not opened during the operation. I have repeatedly convinced myself of this by the use of the catheter in auscultation immediately after the operation. In other cases it is unavoidable in the laying bare of the aditus not to loosen the tympanic membrane, and therfore to open the tympanum. The edge of the tympanic membrane heals again almost without exception, mostly underneath the facial canal along the under side of the medial wall of the aditus or directly onto the incus itself, and moreover so promptly that I take no care at all for it after the first dressing. I catheterize after the fourth or fifth dressing (I have not risked it any earlier), and find that the tympanum is always closed again. In one case alone out of the fifty-one did the closing of the tympanum fail. Here there existed, after successful healing, a communication through which a stream of air passed during catheterization. I had some difficulty in a second case, but after several weeks the edge of the tympanic membrane healed following the use of caustics. I have seen this case after four years, and the tympanum remains completely closed, and everything entirely healed. In eight cases, where the long process of the stapes was plainly carious and its communication with the stapes apparently loosened during the operation, I have excised the incus. In these cases the edge of the tympanic membrane healed again, and a closed tympanum was attained.

I may, therefore, claim as suitable for my conservative method for the preservation of the tympanic membrane, those cases where the chain of auditory ossicles is already interrupted, in which case the number suitable for the operation naturally increases considerably. Hitherto such cases have been considered adapted only for excision, because the malleus and the incus had become worthless functionally. Such cases are suitable for the operation, provided the tympanic membrane and the hammer are preserved.

I have recently had a case in which the incus on both sides was removed in a radical operation two years before. Healing quickly followed within eight weeks, and with a closed tympanic membrane. Contrary to expectation, the power of hearing increased from one-quarter to four meters, and this result has been lasting. I think that in this case the tympanic membrane has become attached to the head of the stapes. One could scarcely account for the resultant improvement in hearing except as the result of the shrinking occurring after the healing of the mucous membrane surrounding the ossicles. This explains many an improvement in the hearing after the customary radical operation. If the incus is not found in the operation, it having been already removed, it is not necessary to excise the tympanic membrane and the malleus, provided there is no prospect of a lasting closure of the tympanum. In view of the distinct result which the conservative radical operation promises where the tympanic membrane is saved, in view of the absolute lack of danger which stamps the operation as an almost harmless interference, in view of the absolute painlessness of the after-treatment, in view of the possibility of operating on feeble patients and those with heart disease under local anesthesia, in view of the absolute certain results in healing, I would ask for such cases an enlargement of the indications for the radical operation, but under the supposition that the tympanic membrane and the hammer are preserved as well as that a closed tympanic cavity remains. I would recommend as soon as the diagnosis is secured to propose the operation to the patient without experimenting with the usual conservative treatment through the audiory canal, which conducted even by the lightest hands, has to patients capable of judging, proven much more disagreeable than the after-treatment following the operation.

Even after a long course of treatment even should the suppurative process subside, we are not in a position to guarantee the patient a real cure, but when he is radically operated on he is dismissed cured after a treatment covering about eight and a half weeks. For that reason I consider that the non-operative treatment cannot be considered as absolutely harmless. Frequent use of the probe and frequent cauterizations can cause injury in the socalled conservative treatment. At all events, the functional result is very much more certain to be good if as little as possible of the diseased part has been manipulated before the operation. On all these grounds I plead for the conservative prophylactic mastoid operation as soon as the diagnosis is absolutely fixed, presupposing always that the cases are appropriate ones for operating, and that the arguments for and against have been carefully weighed in each case. One must individualize and not follow a model.

My operations have been performed for the most part under narcosis. I have often used the local anesthesia method of Neumann, using novocain with the addition of two drops of suprarenin to every cubic centimeter. Even when I use narcosis I previously inject this solution under the skin wall of the bony auditory canal behind and above. This enables me to avoid any severe hemorrhage from the deeper part of the wound, and allows me to operate almost without bloodshed. I have almost never experienced any disadvantage therefrom. With a few exceptions I use Thiersch's flaps in the second to the fourth week, that is, as soon as good granulations cover over a portion of the exposed bone. The one in the back is kept open up to that time. Then I let this close itself or close it through a secondary suture. The period of healing varies from five to thirteen weeks, and has an average of eight and a half weeks. I consider it important to catheterize occasionally during the after-treatment, in order to prevent broad adhesions of the tympanic membrane to the wall of the labyrinth. Where rales appear in the tympanum the condition of the eustachian tube, the nasopharyngeal space, and the nose, must be taken account of.

LXXI.

SUMMARY OF ANNUAL REPORTS OF THE TUBERCULOSIS SANATORIA IN THE UNITED STATES OF AMERICA AND CANADA.

By J. W. Gleitsmann, M. D.,

New York.

This report is made along the same lines as the one of last year in the fourth volume of *The Centralblatt,* page 376. Statements as to location, arrangement and medical supervision are not repeated here except where changes have been made. In the case of newly erected institutions, this data is given. The same abbreviations are used, namely: a. c. (apparently cured), and d. q. (disease quiescent).

The reports have come in this year more slowly than usual. Thirty-eight have been received up to June 15, 1911. Five institutions which reported last year failed to do so this year. Eleven sanatoria reported which had not done so before.

CANADA.

1. Gravenhurst (Ontario).—Muskoka Cottage Sanatorium and Muskoka Free Hospital for Consumptives. Thirteenth annual report, September 30, 1909-10. 149 of the 257 patients in the Cottage Sanatorium remained for some length of time. Of 35 in first stage, 5 a. c. (14%), 24 d. q. (68%). Of 89 in second stage, 2 a. c. (2.2%), 22 d. q. (24.7%). In the thirteen years of existence 16.5% were apparently cured, and in 35% the disease became quiescent. The Free Hospital was increased to twice its former size during the year. Of 262 patients, 234 remained longer than six weeks. Of 87 in first stage, 15 a. c. (17%), 41 d. q. (45%). Of 70 in second stage, 1 a. c. (1.3%), 13 d. q. (18%).

2. Hamilton (Ontario).—Mountain Sanatorium. Sixth annual report, September 30, 1909-10. A new pavilion and children's ward have been erected. Of 136 patients, 96 stayed

longer than one month. Of 20 in first stage, 6 a. c. (30%), 3 d. q. (15%). Of 44 in second stage, 5 a. c. (11%), 11 d. q. (25%).

3. WESTON (Toronto, Ontario).—Toronto Free Hospital for Consumptives and King Edward Sanatorium for Consumptives. Sixth annual report, September 30, 1909-10. A pavilion with twelve beds and a new administration building have been erected since the last report. Only advanced cases received. In the Free Hospital, of 930 patients admitted in six years, 5 a. c., 39 d. q. In the King Edward Sanatorium, in three years, of 236 patients, 23.2% improved.

VERMONT.

4. PITTSFORD.—Vermont Sanatorium. Third annual report, 1909-10. 98 patients discharged. Of 39 in first stage, 15 a. c. (38.5%), 12 d. q. (30.8%). Of 58 in second stage, 4 a. c. (6.8%), 17 d. q. (29.4%). Of 24 patients who stayed over three months who were in first stage, 14 a. c. (58.3%), showing the importance of a longer stay. Tuberculin was used in the cases of those who desired it with good results.

MASSACHUSETTS.

5. (a) RUTLAND. — Massachusetts State Sanatorium. Thirteenth annual report, November 30, 1908-09. Because of the large number of applicants the state has built three new sanatoria, soon to be opened. In the past year 652 patients treated; average time, six months and ten days. Of 208 in first stage, 125 a. c. (61.5%), 52 d. q. (25.6%). Of 341 in second stage, 43 a. c. (12.6%), 147 d. q. (43%). Tuberculin was used in 23 cases with good results, and the previously reported laboratory studies continued.

(b) Fourth annual report of the Trustees of the Massachusetts Hospital for Consumptives, November 30, 1909-10. This board has charge of the three sanatoria and also of the Rutland Sanatorium. Rutland State Sanatorium.—Of 269 patients in first stage, 106 a. c. (39.4%), 118 d. q. (43.8%). Of 239 in second stage, 38 a. c. (11.5%), 141 d. q. (42.8%).

6. North Reading State Sanatorium (E. B. Emerson). Opened September 22, 1909. 392 patients in the past year;

276 discharged; 5 a. c. (1.8%), 32 d. q. (11%), 94 improved (30%).

7. Westfield State Sanatorium (H. D. Chadwick). Opened February 16, 1910. 371 patients; 69 first stage, 91 second stage. 180 patients discharged; 5 a. c. (3.1%), 7 d. q. (4.4%).

8. Lakeville State Sanatorium (S. Coolidge). Opened January 6, 1910. 159 patients discharged; 5 a. c. (3.1%), 7 d. q. (4.4%).

9. BOSTON (Maltapan).—Boston Consumptives Hospital and Day Camp (Edwin A. Locke). Hospital opened October, 1910, Camp July, 1908. First, second, third and fourth annual reports, ending January, 1907, '08, '09, '10. In 1906 the state bought fifty-five acres and made appropriation to furnish accommodations for 250 patients in order to relieve the Rutland Sanatorium and to take in advanced cases. In the fourth year in the first ward of the main building, 104 patients were received and 50 discharged. In the men's pavilion, 62 were admitted, 39 discharged, all advanced cases. In the camp, 683 patients were treated and a school for tuberculous children, in which they are taught hygiene and receive proper nourishment, was equipped.

10. SHARON.—Sharon Sanatorium. Nineteenth annual report, December 1, 1908-09. For women only. Fees, $5.00 weekly. Of 57 patients during the year, 25 a. c. (53%), 9 d. q. (19%) Tuberculin used often, both for diagnosis and treatment.

RHODE ISLAND.

11. WALLUM LAKE.—State Sanatorium. Fifth annual report, 1909. New buildings for laundry and heating plant. All cows in dairy tested with tuberculin. 290 patients discharged, average stay 143 days; 29 a. c. (10%), 105 d. q. (36.2%). 173 patients remained 50 to 701 days. Of 17 in first stage, 12 a. c. (70%), 5 d. q. (29.4%). Of 152 in second stage, 16 a. c. (10.5%), 75 d. q. (49.3%). Sixth annual report, 1910. Institution has now 130 beds. 288 patients discharged, average stay 153 days; 19 a. c. (6.6%), 102 d. q. (35.4%). 169 patients remained 90 to 833 days. Of 10 in first stage, 4 a. c. (40%). 5 d. q. (50%). Of 155 in second stage, 14 a. c. (9%), 73 d. q. (47%).

CONNECTICUT.

12. HARTFORD.—Wildwood Sanatorium. Annual report, September 30, 1909-10. 151 patients discharged, average stay 108 days; 11 a. c. (7%), 39 d. q. (26%). 65 patients remained 3 to 18 months. Of 16 in first stage, 7 a. c. (43%), 7 d. q. (43%). Of 37 in second stage, 2 a. c. (5.4%), 19 d. q. (51%) Tuberculin in suitable cases.

13. WALLINGFORD.—Gaylord Farm Sanatorium. Sixth annual report, May 1, 1909-10. 166 patients discharged; 104 stayed on an average 161 days. Of 23 in first stage, 3 a. c. (13%), 18 d. q. (78%). Of 75 in second stage, 1 a. c. (1.3%), 20 d. q. (27%). Statistics from 1904 show: 513 patients, 50% in first stage, 24% in second stage either a. c. or d. q. Because of lack of space the comparison of results between patients treated with and without tuberculin cannot be given.

NEW YORK.

14. RAY BROOK.—New York State Hospital for the Treatment of Incipient Tuberculosis. Ninth annual report, 1909. Present capacity of 160 beds will be increased during 1910 to 248. Of 262 patients discharged, 231 remained on an average nine months. Of 128 in first stage, 100 a. c. (78%), 18 d. q. (14%). Of 79 in second stage, 16 a. c. (20%), 44 d. q. (55.6%). Attention is called to the long waiting list and to the necessity of an early diagnosis.

15. Albany Central Federation of Labor Tuberculosis Pavilion (A. T. Laird). Second annual report, May 1, 1909-10 Founded by and under the control of the central committee of the labor unions of Albany, fourteen of which contribute towards its support. High situation in the southern part of the city, capacity 14 patients, two sick wards. During the year 30 patients were admitted, 6 in first stage, 6 in second stage; 4 a. c., 6 d. q.

16. LAKE KUSHAQUA.—Stony Wold Sanatorium. Ninth annual report, 1909. During the year many liberal bequests have been received which will be used for new buildings. 130 patients remained on an average of twenty-seven weeks. Of 34 in first stage, 24 a. c. (70%), 6 d. q. (17%). Of 70 in second stage, 8 a. c. (11%), 29 d. q. (41%). Of the 24 chil-

dren, 16 were in first stage, 12 a. c. (75%), 2 d. q. (12.5%); 8 in second stage, 2 a. c. (25%), 2 d. q. (25%). An industrial bureau has been opened which provides support and furnishes positions to those who have been discharged as cured or improved, so that it may not be necessary for them to engage in work which might be injurious to them.

17. LIBERTY.—Loomis Sanatorium. Fourteenth annual report, October 31, 1909-10. During the year a building for employes was erected and a pavilion enlarged. In the pay wards 242 patients were discharged, of whom 187 remained more than one month, 23 a. c. (12.3%), 29 d. q. (15.5%); 16 of these were in first stage, 8 a. c. (50%), 3 d. q. (18.7%); 88 in second stage, 15 a. c. (17%), 22 d. q. (22.7%). In the free wards 139 discharged, 24 a. c. (17.2%, 42 d. q. (30%). Tuberculin was used in selected cases.

18. NEW YORK.—(a) Montefiore Home for Chronic Invalids. Twenty-sixth annual report, September 30, 1909-10. The wish of the directors to erect a larger institution in a more suitable locality is soon to be realized by the purchase of a large area in the northern part of the city. 472 patients were treated during the year, 122 of whom had tuberculosis. 47 of these were discharged, 9 improved.

(b) Montefiore Country Sanatorium. 564 patients treated, 231 in first stage. Of these, when discharged, 41 a. c. (17%), 63 d. q. (27%). Of 17 advanced cases, 1 a. c., 11 d. q.

19. SARANAK LAKE.—Adirondack Cottage Sanatorium. Twenty-sixth annual report, October 31, 1909-10. With the means at their disposal a new road has been built which makes access to the place much easier. 321 patients treated, 211 discharged; 37 a. c. (17.5%), 117 d. q. (55.5%). 191 patients remained on an average over six months. Of 51 in first stage, 25 a. c. (49%), 19 d. q. (37%). Of 136 in second stage, 10 a. c. (7%), 91 d. q. (67%). Tuberculin treatment of 124 patients produced no essentially different results.

20. SARANAK LAKE.—Tuberculosis Reception Hospital (Edward R. Baldwin). Ninth annual report, February 1, 1909-10. Capacity, 18 patients; situated on a hill. Takes patients who need attention and are stopping at the place and those who cannot be taken into the Cottage Sanatorium. 135 patients discharged, 5 in first stage, 76 in second stage; 11 d. q. (13.5%), 65 improved (80%).

21. YONKERS.—Sprain Ridge Hospital (Wm. Vogeler). First and second annual reports, October 1, 1908-09-10. Elevation, 250 feet. 120 acres, administration building and four pavilions with six beds each. Terms, $7.00 a week. The report of the second year shows that of 51 patients discharged the first year, 40 are now in good health.

The second report shows 47 patients treated, 32 discharged; 17 in first stage, 17 d. q. (100%), 6 in second stage, 6 d. q. (100%). It is likely that some physicians would have designated these cases as a. c. Tuberculin and X-ray were used.

NEW JERSEY.

22. GLEN GARDNER.—New Jersey Sanatorium for Tuberculous Diseases (S. B. English). Ninth annual report, October 31, 1909-10. Situated on a hill facing south, 1000 feet above the sea level, 600 acres. Building for steam heat, lighting, administration building with pavilions facing east and west. One pavilion higher than the others, capacity 175, for the more hopeful cases. Of 358 patients discharged, 286 remained more than a month. Of 130 in first stage, 75 a. c. (58%), 52 d. q. (40%). Of 113 in second stage, 5 a. c. (4.4%), 51 d. q. (45%). The records show that of patients discharged from 1907-09, 163 a. c., and 57 of the 146 d. q. are now able to work.

PENNSYLVANIA.

23. MONT ALTO.—State South Mountain Sanatorium.. Annual report, May 31, 1908-09. The institution was enlarged by the erection of a new building of 144 beds. 589 patients discharged during the year, 125 d. q. (21%), 281 improved (47%). Of 67 in first stage, 34 d. q. (50.7%), 28 improved (41%). Of 252 in second stage, 50 d. q. (19%), 139 improved (55%). Money has been appropriated by the state legislature for two additional sanatoria, and land has already been purchased in the western part of the state, in Cresson, in the eastern part in Hamburg.

24. SCRANTON.—West Mountain Sanatorium. (J. M. Wainwright). Eighth annual report, 1909. Of 30 patients discharged during the year, 5 a. c. (16%), 20 improved (66%).

25. WHITE HAVEN.—White Haven Sanatorium (President, L. F. Flick; Director, A. Armstrong). Twelfth annual re-

port, March 1, 1909-10. Since its foundation in 1901 up to the present time, poor patients were treated for nothing; now, however, that the state has erected sanatoria and his withdrawn its support from the White Sanatorium, it charges $7.00 to $9.00 a week. Capacity, 216. Elevation, 1500 feet; area, 215 acres. With donations received during the past year a pavilion and a shack for advanced cases have been erected, 586 patients discharged, 196 having remained from 1 to 3 months, 2 d. q. (1%), 21 very much improved (10.7%). Of 293 who remained more than three months, 66 d. q. (22.5%), 82 very much improved (28%).

MARYLAND.

26. Sabillasville.—Maryland State Tuberculosis Sanatorium (V. T. Cullen). Third annual report, 1909. Capacity, 210. Elevation, 1500 feet; 198 acres. Terms, $3.50 a week. Administration building, 9 pavilions each for 20 patients, a hospital for 20, and a building for 10 convalescents. 246 discharged since the institution was opened in August, 1908. Of these, 97 remained three months or less. Of 27 in first stage, 7 d. q. (7.2%), 42 improved (43%). 149 remained on an average 160 days, 5 a. c. (3.3%), 52 d. q. (34.9%), 73 improved (48.9%).

MISSOURI.

27. Mount Vernon.—Second annual report, 1910. A new building for 70 patients has been erected, bringing the total capacity up to 140 beds. Of 347 patients, 94 d. q. (27%), 131 improved (37%). Tuberculin preparations are being used for diagnosis and treatment.

ILLINOIS.

28. Napierville.—The Edward Sanatorium. Annual report, 1909, with an account of the activity of the institution since its founding in 1907. Capacity, 60. A throat ward and a laboratory have been erected. 313 patients discharged, 76 remaining less than one month. Of the remaining 277, 176 in first stage, 60 a. c. (35%), 80 d. q. (45%), 91 in second stage, 36 d. q. (39.6%). 19 were treated with tuberculin, 27 with B. E., and 43 with B. F.

MICHIGAN.

29. HOWELL.—Michigan State Sanatorium. (E. B. Pierce). Second annual report, July 1, 1908-10. Six new pavilions erected, capacity now 80. 90 patients discharged in 1909, 32 in first stage, 18 a. c. (56%), 7 d. q. (21%). Of 104 discharged in 1910, 27 in first stage, 13 a. c. (48%), 7 d. q. (25.9%); 56 second, 4 a. c. (7%), 21 d. q. (37.5%).

MINNESOTA.

30. WALKER.—State Sanatorium for Consumptives (S. B. Ohlinger). Report from July, 1908-10. Six new pavilions, capacity now 110. During the two years 314 patients discharged. Of 62 in first stage, 17 a. c. (27%), 24 d. q. (38%). Of 146 in second stage, 4 a. c. (2.7%), 39 d. q. 26%).

NEW MEXICO.

31. FORT BAYARD.—U. S. Army Hospital (Lt. Col. G. E. Bushnell, Commander). Report for 1909. New buildings nearly completed. Of the total number, 431 patients, 70 in first stage, 16 a. c. (22.8%), 41 d. q. (58.5%); 247 in second stage, 21 a. c. (8.5%), 5 d. q. (2%). 232 patients remained six months or longer. Of 43 in first stage, 13 a. c. (30%), 5 d. q. (11.6%). Of 137 in second stage, 21 a. c. (15%), 7 d. q. (5%).

32. FORT STANTON.—Sanatorium for Consumptive Seamen, U. S. Navy. Report for one year ending June 30, 1909. There are in all 97 tents, in which 194 patients can sleep. 205 admitted, 188 discharged; 2 cured, 26 a. c. (13.8%), 37 d. q. (20%). Report ending June 30, 1910. 149 admitted, 206 discharged; 41 a. c. (20%), 51 d. q. (24%). A number were treated with autovaccines with apparently good results.

COLORADO.

33. COLORADO SPRINGS.—Union Printers' Home. May 31, 1909-10. 49 patients with tuberculosis, of whom 37, after a stay of two to three months, were again able to work.

34. COLORADO SPRINGS.—Modern Woodmen of America Sanatorium. (J. E. White.) Opened December, 1908. Report

up to April 1, 1910. 1,000 acres near the city. Supported by the Modern Woodmen of America. Admits only members of that order whose cases are not too far advanced. Every patient has his own cottage. Of 174 patients, 136 remained over three months, 36 a. c. (26%), 39 d. q. 28%).

35. DENVER.—National Jewish Hospital for Consumptives. Tenth annual report, May 1, 1909-10. Very thorough, detailed medical report. 257 patients discharged, remaining on an average six months; 60 d. q. (23%), 53 much improved (21%). Of 121 in first stage 55 a. c. (45%), 28 d. q. (26%). The history of each patient is given, complications involving the eyes, ears and throat, blood examinations, diagnosis by means of agglutination, Wassermann reaction, opsonins, results with B. E., B. F., etc.

36. EDGEWATER.—Evangelical Lutheran Sanatorium. Report pril 30, 1909-10. 98 patients treated; average length of stay, 190 days; 55 improved (56.6%). Of 63 patients in advanced stage, 30 improved (47.6%).

37. EDGEWATER.—Sanatorium of the Jewish Consumptives' Relief Society. Sixth annual report, 1909. The New York Woman's Aid Society erected a new pavilion, capacity now 110. Of 138 regular patients, 99 improved. Report of each case.

CALIFORNIA.

38. LOS ANGELES.—Barlow Sanatorium. Seventh annual report, September 1, 1909-10. During the year a building for social purposes and one for female employees were erected. Of 65 patients discharged, 7 in first stage, 27 in second stage, 7 a. c. (10.7%), 5 d. q. (7.6%), 26 improved (40%). Histories according to Turban.

SOCIETY PROCEEDINGS.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

Seventeenth Annual Meeting.

Atlantic City, June 1, 2 and 3, 1911.

(Continued from September Number.)

Friday, June 2, 1911.

SYMPOSIUM—DISEASES OF THE SALIVARY GLANDS.

XI. The Teaching of Otolaryngology in Undergraduate and Postgraduate Medical Schools.

Dr. S. MacCuen Smith, Philadelphia. The object of medical instruction to the undergraduate should be the development of a well-rounded general medical education, and although the teaching of specialties embraces a very important part of this comprehensive plan, we should clearly differentiate between the instruction necessary for the undergraduate and that necessary for the proper equipment of the postgraduate.

The author presented four reports of the methods of teaching otolaryngology to the undergraduates in sixteen institutions in the United States and two in Canada. In the majority of these medical schools didactic lectures have been virtually abandoned, the instruction being almost wholly clinical. The greater number also confine their teaching to the fourth year. In the two Canadian schools, which have a five year course, the subjects are taught in both fourth and fifth years. Only seven schools made the definite statement that final examinations are required in these branches, although the various reports would indicate that an examination, if not held by the respective Chairs, is included in the general examination in medicine and surgery in the remainder.

It appears further that the undergraduate is very much better taught, for his purpose, than the postgraduate. Apparently much remains to be accomplished in postgraduate teaching, both as to methods and system, as well as a more comprehensive classification of students and their needs. The shortcomings in postgraduate instruction are emphasized in one communication, the author of which said: "Postgradate teaching in America is very unsatisfactory."

DISCUSSION.

Dr. Joseph H. Abraham, New York, confined his remarks chiefly to postgraduate work. In undergraduate schools the teaching of normal anatomy of the nasal cavity is very deficient. In the teaching in postgraduate schools certain difficulties might be enumerated. First, the average student comes to take a special or general course, the length of which is usually about three months. Second, he desires to see the professor operate, and does not care to listen to didactic lectures. Third, the minute anatomy of the upper respiratory tract is practically unknown to him. Fourth, histology is almost entirely unknown to him. Furthermore, physicians come to prepare themselves for a specialty who are not able to handle instruments for examinations, especially the head mirrors, the rhinoscopic and laryngeal mirrors. They cannot make a rhinoscopic examination.

The course which the speaker endeavors to give is first operative upon the cadaver, the classes being limited to four students. This costs fifty dollars, which they seem to consider expensive. Six bodies are used in the course. Eight lectures, of about an hour and a half each, are given with this part of the work. Before this operative work is given the gross anatomy is demonstrated upon various cut sections. The majority of students consider this course too high and do not take it.

After the anatomy lessons are finished the clinical work is taken up. The histories of the patients are carefully gone over, the various pathologic lesions pointed out, and the diagnosis made. This does not seem to attract the students.

At this stage of the instruction as few operations as possible are shown, as they are not prepared to benefit by them. The histology and pathology should, in the meantime, be given in a special course.

The students are then given patients to treat. The deficiency in ability to handle instruments is now discovered. Many of the men cannot examine the nose or larynx, they cannot even control a head light. After they have mastered the method of examination, the handling of the instruments and the diagnosis, they are then given minor operations. The chief aim of most of them is to do a submucous operation, and to remove adenoids and tonsils.

DR. WENDELL C. PHILLIPS, New York, said it is a matter of pride and congratulation that a deceased member of this society, Dr. D. B. St. John Roosa, became the founder of postgraduate medical education in America. Dr. Roosa did more for the advancement of postgraduate work than any other single member of the profession in this country.

In a private conversation with Dr. Knowles, on the journey down, the latter regretted the use of the term "postgraduate;" the speaker agreed with him. It should be called advanced medical education.

Teachers in postgraduate institutions have to deal with two general types of practitioners: First, those who feel the need of higher medical instruction in order to be able the better to conduct their own work as general practitioners. Second, those who desire to lay the foundation for specializing in the various branches of medicine and surgery. The two classes of practitioners require different teaching. The postgraduate institution should meet this demand. At the New York Postgraduate Medical School and Hospital this demand has been met. In the department of otology and rhinology the general practitioner is permitted to attend the clinical lectures of the teachers, and all operations and demonstrations, and are encouraged to examine all cases and to draw upon charts their findings.

With especial reference to otology, his branch, Dr. Phillips spoke of the deplorable ignorance of the average medical man, despite the fact that an unusually high order of physicians attend the courses. Very few of them have ever seen a drum membrane with reflected light. The majority of them are very glad to overcome this deficiency, and welcome the practical instruction which they receive. He laid great stress upon the teaching of otoscopy, first showing the normal drum membrane, with its landmarks, etc. When the student has learned this, he is then taught the pathologic conditions, after which he is allowed to witness operations. This course is covered in from three to six months.

Dr. Phillips hoped he would never hear again that it is the aim of postgraduate schools in this country to send out specialists after from six weeks' to three months' instruction. Only recently he had heard a clinical professor in an undergraduate institution make this criticism in an after-dinner speech at a medical dinner. He thus showed his ignorance of the facts. In the above school these special students are distinctly told that they should not attempt to practice without giving from one to two years to prepare for it. The number of men who come prepared to devote a year or more to such special duty is increasing year by year.

He had become convinced that in both undergraduate and postgraduate schools the tendency is to swing too far away from didactic teaching. He considered this a mistake, and in his work at the Postgraduate he gives each year a few didactic lectures on the diseases of the ear.

The gross and minute anatomy, physiology, pathology and histology of the ear are taught in special courses, and these are taken by the majority of the students.

They are also given a special course in the operative surgery of the ear, a course which the speaker had the honor of founding in the above named school. Each student performs the entire list of operations on the cadaver.

It is the custom in the Postgraduate School, after a man has taken all these courses and has witnessed all the operations, to permit him to operate upon the living subject under the immediate supervision of a professor. For this a special fee is charged. Courses on the living are also given in other departments of the school. It is very encouraging to the practitioners throughout the country to know that they can receive this kind of instruction.

In order to accomplish the work just outlined, the proper hospital equipment is necessary. In no country are there better hospital facilities than in America. At the Postgraduate and at the Polyclinic there is ample provision for the work. The Polyclinic is building a magnificent institution, and within three months the Postgraduate will have a hospital capacity of about four hundred beds, the hospital and school being all under one roof.

Dr. Phillips did not agree with the pessimistic remarks of Dr. Myles. The pride of otologists, and of all specialists, should be to make America a center for advanced medical instruction. This is sure to come, and American enterprise and devotion will accomplish it. We are already successful rivals of the best of European institutions.

He regretted that any postgraduate institution gives certificates unless upon examination. In the New York Postgraduate, certificates signed by the president and secretary, stating the exact instructions received, are given, but are not signed by the professors.

Dr. Charles P. Grayson, Philadelphia, confined his remarks chiefly to the teaching of laryngology in undergraduate schools. "Poeta nascitur, non fit" applies even more to the specialist than to the poet. He doubted the advisability of devoting more time to special work in laryngology in undergraduate institutions. The student receives instruction in this branch in his third year, during which time he is not only given a knowledge of the more common diseases of this region, but is made to realize the unavoidable limitations of the general practitioner. In other words, to know when his own ability ceases and when he should seek the assistance of the specialist. A good deal of danger results from teaching these young men enough to make them think they are specialists. He particularly warned his students against undertaking certain cases, which the short period of instruction cannot fit them for treating.

In an elective course the teacher should do some of the electing. He agreed with Dr. Dench that it is a waste of time on the part of the instructor, as well as the student, to try to teach those who have neither fitness nor liking for the work. In the first hour's instruction the teacher can discover whether a student has or has not any talent for special work. Some men can never learn to handle instruments skillfully, whereas others have a light and delicate touch from the beginning. It is useless to waste time with the former class.

Without adding to the time already allowed in the curriculum, students could be taught didactically in the third year sufficient to make them safe, if not accurate, diagnosticians, and in the fourth year they could be given all the clinical work which is necessary. Operative work should be confined to postgraduate institutions.

In conclusion, Dr. Grayson thought it much wiser to endeavor to discover and develop natural ability than to give exhaustive information which, failing of complete digestion, might often be misapplied.

DR. HENRY O. REIK, Baltimore, confined his remarks to the teaching of otology in undergraduate schools. He agreed with the views expressed by Dr. Grayson, and had expressed himself in similar terms in the preface to his "Manual for Students of Otology." No more time than now given should be spent in the instruction of these students, but more should be accomplished in the time already allotted. All that the public demands or expects to know is the essentials, the things which, as general practitioners, they should be prepared to meet. They should be equipped with that knowledge which best enables them to recognize diseases and to know when to call upon the specialist. If a student desires to become, or is fitted for becoming, a specialist, he should be given the practical points first, and then have these demonstrated clinically as far as possible.

The speaker had eliminated descriptions of operations from his course, teaching the recognition of the symptoms of the various diseases. Operations at Johns Hopkins Hospital are open to the students, who are invited to attend them, but this is in no sense a compulsory part of the course.

A very distinct line should be drawn between the work of the practitioner and the specialist. Doctors should be given a more comprehensive knowledge in the short time allotted to the specialties.

DR. MAX A. GOLDSTEIN, St. Louis, said it is evident that there is a wide difference of opinion as to how undergraduate students should be taught. He wished to emphasize very strongly the moral obligation of every teacher of otolaryngology to give to his pupil just as much as possible of the subject matter comprising the given specialty. The student, after three or four years in college, goes out to practice, and he will do tonsil and adenoid operations, treat acute and chronic otitis media, etc., and he will not send these cases to the specialist. He will send the more extensive and difficult operations, such as the mastoid, to the specialist, but the others he will undertake himself. The moral responsibility, therefore, rests upon otolaryngologists as teachers to train the student in the diagnostic, therapeutic and operative work which is a part of his general practice.

Dr. Goldstein allows his senior students to operate under direct supervision, upon tonsils and adenoids, to incise drum membranes, etc., thus making them more definitely familiar with the instruments and more confident in themselves. He did not see why there should be an embargo placed upon operations which it is necessary for the undergraduate to perform as soon as he gets out in practice. If a man goes to a postgraduate school without knowing how the drum membrane looks, it is the fault of the teachers in the undergraduate school.

Dr. J. A. Stucky, Lexington, spoke in behalf of the men who take postgraduate instruction, either in Europe or America, or both. It is well for Americans to hear the criticisms of these fellow-Americans. The men to whom he referred are no ordinary individuals, but doctors who are graduates of the best schools in America, and who have taken postgraduate courses after having practiced medicine for several years. These men say that Americans are too superficial, in too big a hurry, and that they attempt to teach more than students,. as general practitioners, can utilize. The instruction, furthermore, is veiled in so much of mystery that the students are confounded. He spoke especially of three men who are doing splendid work. What they wanted, and what the average doctor wants, is enough to advise a patient what to do. The speaker was not convinced that the average man who takes a postgraduate course does so with the idea of developing into a specialist. If so, this idea should be discouraged, but the diagnostic part of the eye, ear, nose and throat work should be emphasized. He had seen several men holding postgraduate certificates attempt to remove turbinates, with serious results. Certificates which grant the legal right to practice a specialty should not be carelessly granted.

XII. The Method of Giving Anesthesia in Operations Upon the Upper Respiratory Tract.*

By James T. Gwathmey, M. D.,

New York.

DISCUSSION.

Dr. Francis R. Packard, Philadelphia, confined his remarks to a brief outline of the method employed at the Pennsylvania Hospital in Philadelphia, which is very generally employed in the hospitals throughout the city.

The vast majority prefer ether as the anesthetic agent, in combination with some other drug, usually ethylchlorid. The anesthesia is begun with ethylchlorid and switched to ether, with Dr. Gwathmey's or some other similar apparatus. He had used the Rupert apparatus.

The anesthetic is given by a trained woman anesthetist. The position which he prefers, and which most of his colleagues prefer, is the recumbent, with a sand pillow under the head and shoulders. The secret of the anesthetic depends upon the skill of the anesthetist, who gives most successfully the agent to which he is most accustomed. The old method in most hospitals was to have the resident interne give the anesthetic, a custom which was responsible for more disasters than is generally realized. The giving of an anesthetic to a patient about to be operated upon for the removal of tonsils or adenoids is too serious to be entrusted to one just out of college.

Disasters in the giving of anesthetics often occur as the result of the improper preparation of the patient before the operation. He cited two cases in his own practice which illustrated this point; the patients having each of them eaten a full meal, nearly asphyxiated during their anesthesias.

Dr. Joseph A. White, Richmond, said the choice in anesthetics is generally given to chloroform in the South, though there is now a tendency to give ether or ether mixed with chloroform, as suggested by Dr. Gwathmey. This is more especially the case since the old cumbersome methods of giving ether have been discarded. Probably we do not credit the anesthetic with all the fatalities that might be traced to this source. Deaths occurring four or five days after the operation are usually attributed to the operation, or to the patient's inability to recuperate, whereas many such cases are directly caused by the effects produced upon the patient's system by the anesthetic, and, therefore, should be attributed to the anesthetic.

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*See page 841.

In doing operations about the face and mouth it is desirable to eliminate all apparatus, as well as the anesthetic. In such cases rectal anesthesia is advantageous, and should come more into favor than it is at present. The anesthesia is begun by mouth and continued by the rectum. Notwithstanding the fact that the anesthetist cannot watch the reflexes, it is not as dangerous as pulmonary anesthesia. Moreover, there is no necessity of any complicated apparatus, an ordinary wide mouthed bottle with a cork in which are two holes, with two glass tubes bent at right angles, to one of which a small hand ball is attached, and to the other the rectal tube. This is half filled with ether and placed in a vessel of hot water, because the vapor should be warm and the hot water makes it evaporate more readily. It is not necessary to put the rectal tube very far into the bowel, from four to six inches suffices. The anesthetist places one hand over the sigmoid flexure to keep track of the amount of tympanites, and uses the other to force the vapor into the bowel. If the abdomen should become too much distended, it is only necessary to separate the rectal tube from the bottle, and by pressure upon the abdomen, the gas is allowed to escape, and the tube is then reconnected. The preparation of the patient beforehand consists in giving a brisk purge the day before, and two high soap enemata two hours before the operation. If there is much gas a soda enema might be given. To get rid of the peristaltic action a small dose of morphin or hyoscin may be given.

Dr. J. A. Stucky, Lexington, emphasized the importance of the point Dr. Gwathmey made with reference to the quantity of the anesthetic used in the mastoid operation. The majority of operators had been in the habit of using perhaps four or five times as much as is necessary. After the first stage of the operation practically no anesthetic is required. In doing the radical mastoid operation, if the surgeon will clean out the middle ear first, instead of last, it will be possible to decrease the quantity of anesthetic one-half. Many slow recoveries and much of the socalled shock is due to improperly conducted anesthesia.

Rectal anesthesia undoubtedly has a place in surgery, but the esthetic objection to the method must be overcome. It is not necessary to introduce the tube so far, four or five inches being sufficient. He had found morphin and hyoscin beneficial in a number of cases.

DR. GWATHMEY, in closing the discussion, said the surgeon who insists upon the use of any particular anesthetic, no matter what it may be, more or less handicaps the patient. In many cases contingencies are apt to arise which neither the surgeon nor the anesthetist can anticipate, and the anesthetic must be varied in whatever manner the exigencies of the case may demand.

Referring to the use of chloroform in the South, Dr. Gwathmey called attention to the fact that he was one of the first to show that chloroform is safer in the South than in the North, and to establish the reason for this by laboratory experimentation. He had found that it requires twice as much warm chloroform to kill an animal as it takes of cold chloroform to accomplish the same end. In giving chloroform warm the vapor tension is decreased, making it almost impossible to give an overdose. The warm vapor is inhaled and exhaled with greater rapidity than is the cold vapor. For this reason it is safer to give chloroform in a warm climate than in a cold, and in the summer than in the winter.

He considered Sutton's apparatus for giving rectal anesthesia the best. It has a mercurial manometer attached, and so arranged that if the tension goes beyond a certain point a valve lets out the surplus gas, making it impossible to get overdistension. The apparatus is also supplied with a thermometer for regulating the temperature of the ether. The ether should go in at a temperature of 98° or 99°, and no higher.

If water is not available for the suction apparatus, the electrical pump may be used, but the speaker preferred the water pump, because it is simple and does not get out of order. Air suction is preferable to either water or electricity.

SYMPOSIUM—ATYPICAL MASTOIDITIS.

XIII.

Dr. Eugene A. Crockett, Boston. Atypical mastoid disease is not only far more common than is ordinaryily supposed, but its early recognition is very important on account of the fact that the intracranial complications of acute mastoid infection are more common is this variety of mastoid disease than in any other. The same may be said of thrombosis of the lateral sinus and of general septicemia.

Atypical disease of the mastoid process occurs by reason of an abnormal type of mastoid bone rather than from any other etiologic factor. It will be seen just as commonly after a simple influenza infection as it will be after a pneumococcus infection, or scarlet fever, typhoid fever, etc. In all cases where mastoid disease is suspected and cannot be proved, it is well to remember that a carefully taken X-ray picture of the mastoid furnishes an absolutely correct means of determining what process is present in the temporal bone. It should also be remembered that such a process may be quite devoid of local or general symptoms sufficiently severe for diagnostic purposes, particularly that it may exist in cases in which there is only an indefinite history of discharge from the ear and which present a normal drum membrane and canal wall. These are the cases of socalled primary mastoiditis. The presence of swelling of the posterior-superior canal wall is one of the most diagnostic single symptoms of mastoid disease, and when present is of decided importance in making a definite diagnosis.

XIV.

Dr. James A. Stucky, Lexington. Certain anatomic conditions favor the development of atypical or symptomless mastoiditis. Heine described these as cases: (a) In which a thickened tympanic membrane resisted the suppurative process, and pus broke through the annular ligament of the stapes, infecting the labyrinth, from which purulent meningitis resulted, ending in death. (b) In which there is a large aditus ad antrum and the mastoid cells are situated exteriorly to the lateral sinus. (c) In which there is a diploic mastoid process with a medium sized antrum and large cells extending into the root of the zygoma. (d) In which there is a very thick or sclerosed cortex.

The author's experience accorded with that of Barnhill, Heine and others. (1) That suppuration may take place in the mastoid antrum, mastoid cells, or both, and may even be complicated by intracranial abscess, without the drum membrane even having ruptured, and consequently without the ear having discharged. (2) That mastoid abscess without any of its complications may occur, or at least assume a form of dangerous activity months or years after a suppurating ear has apparently healed; at least after the perforation in the drum membrane has healed and all external discharge has ceased. In such cases some infective focus of pus has remained latent in the structure of the temporal bone. A case in point was cited.

Atypical mastoiditis is most frequently met in the exanthematous diseases, diabetes, typhoid fever, pneumonia and influenza.

Often a diagnosis can be made only by exclusion. The special value in these cases of frequent differential blood count, percussion and transillumination of the mastoid process was emphasized. When in doubt, however, the mastoid should be explored. The present knowledge of the disease and the perfection of technic in operation does not justify one, in the face of the elements of uncertainty and possible dangers, in preserving a hesitating attitude in doubtful cases.

XV.

Dr. Thomas J. Harris, New York. The first mastoid operation was performed in this country in 1864. For a long time the operation was resorted to with great hesitancy, and under no exact indications. Gradually, with the acquirement of a more accurate knowledge of the anatomy and pathology of the temporal bone, the mastoid operation acquired a well recognized place in surgery. Unfortunately, when the indications for its performance were thought to be well established, cases began to be reported which did not conform to the classical symptomatology. This number has greatly increased during the last twenty years. No attempt, however, has been made toward a systematic grouping of these cases, or a consideration of them as a whole. It has seemed fitting, therefore, to make such an attempt.

The term atypical mastoiditis is applied to inflammation of the mastoid without perforation of the drum membrane. Cases of this character may be considered under the following heads: (1) Primary mastoiditis—an inflammatory process beginning in the mastoid bone without previous involvement of the middle ear. (2) Latent mastoiditis—where the infection of the mastoid has proceeded from the middle ear, the involvement of the latter not being sufficient to cause rupture of the drum membrane, or, in some cases, even to produce any changes in its appearance. (3) Hysterical mastoiditis, or mastoidalgia—which occurs chiefly in females, first, without associated disease of the ear; second, in the presence of acute inflammation of the middle ear; third, where an inflammation, suppurative or otherwise, of the middle ear has previously existed. (4) Condensing or sclerosing mastoiditis—formerly regarded as a distinct entity, but now believed to be identical, in the main, with mastoidalgia, a pseudomastoiditis, in no sense a true entity. (5) Syphilitic mastoiditis—a rare form, occurring in syphilitic patients, in which, with a normal ear drum, there is excessive tenderness over the mastoid process, with a history of discharge from the ear.

DISCUSSION.

Dr. Frank Allport, Chicago, said that he had seen so many cases of atypical mastoid disease that he sometimes wondered if there were any really typical cases. One of the most interesting and important points suggested by this series of papers is the frequency with which one encounters cases of mastoiditis which present very few of those characteristic symptoms which we are led to believe are dependable operative signs. He refers to those cases in which there is no drooping of the meatal wall, no mastoid tenderness, no swelling, no temperature, and in which the blood count is not significant.

He has not had much experience with X-ray diagnosis, but believes that it holds great promise for the future, as soon as better pictures are made and we acquire the ability to interpret the significance of such pictures.

As a rule, diagnosis must be made from the general picture presented by the patient, everything being taken into consideration; and it should always be borne in mind, as Dr. Stucky has so aptly stated, that one cannot afford to maintain a hesitating policy. He had never seen a case harmed by a simple mastoid operation, but he had seen many lamentable results follow the tardy performance of the operation.

He did not know what Dr. Stucky meant by exploratory operation. He did not see how one could very well explore the mastoid cavity without performing an actual mastoid operation. He presumed that Dr. Stucky meant that the operation should be performed along classical lines and then the interior of the bone examined in the search for pathologic conditions. He remembered a case reported by him some years ago, in which the patient complained of sudden and severe pain in the mastoid bone. The physician requested that the mastoid be opened, but Dr. Allport could not see his way clear to the performance of the operation at that time. He believed it to be a case of neuralgia and advised treatment therefor. There was no swelling over the mastoid, no tenderness, no drooping of the meatal wall, no perforation of the drumhead, a perfectly normal appearing drumhead, there was no temperature and the blood count was not significant. Nevertheless, the patient passed a miserable summer, and finally returned again in the fall with request from the family physician that the mastoid be opened. Dr. Allport reluctantly consented to open the mastoid, and declared that he had never seen a more destructive process than in this case. Whether it was a case of primary mastoiditis or not, he did not know. In fact, he could not say positively from his own experience that there were any real cases of primary mastoiditis, although he presumed from the writings of other men that such cases must exist. This patient positively asserted that she had never in her life had earache or discharge from the ear, and the appearance of her drumhead certainly bore out this statement.

Dr. Allport cited another case of what appeared to be primary mastoiditis in a child six months of age. There was no discernible signs of middle ear disease and no history of such a disease, and yet the child had a distinct mastoiditis. Still he felt that possibly a middle ear abscess might have existed for a few days, and the parents, who were ignorant, might not have noticed it.

Dr. Allport was inclined to think that the cases of mastoidalgia, mentioned by Dr. Harris, were very rare. He remembered seeing such a case a year or so ago in the person of an old maid of neurotic disposition, who consulted him for intense pain in the mastoid process. This was the only symptom she had. The mastoid bone was opened for relief of the pain. No disease was found, but the bone was extremely sclerotic. The operation effected a cure. Whether there was nerve compression caused by the sclerosed bone, he did not know, but in all events the patient was cured by the operation and has not complained since. He believes that one is justified in opening the mastoid in cases of persistent pain in that region, even in the absence of other symptoms, as no harm can come from a properly performed mastoid operation.

Dr. George A. Leland, Boston, had been much interested in the papers of the symposium, but particularly in Dr. Harris' classification of cases of atypical mastoiditis. It had seemed to him, however, that it is impossible to classify them very definitely and distinctly, because they are of such infinite variety. To paraphrase a recent light opera song, he had never seen two mastoids alike, nor ever seen one alike twice. As knowledge increases, however, it is probable that the classifications will be modified, because the diagnosis will be made before the mastoid becomes really what is now considered typical. During the past few years in the City Hospital, in order to save time, both for the hospital and the patient, and for the sake of the hearing, early operations have been done, not waiting for typical classical symptoms, and hence, as it is natural to suppose, the early symptoms would present a variety which it would be difficult to put in strict classes. Hence, a very large majority of them would not be classified as typical according to our definition of today. It seems to him that mastoid cases can be put into two large groups: those in which the symptoms, edema or inflammatory swelling, or pain with tenderness and projection of the auricle, might be considered the obvious group; and in which none of these symptoms are present, but in which the discharge is greater than could possibly come from the small tympanic cavity; and in which the drumhead refuses to heal and is accompanied by more or less swelling of the flaccid part, together with that of the periphery, which would be equally typical but not obvious; and which might also be called typical. These are cases where valuable time is lost because the general practitioner, or perhaps the conservative specialist, has to wait for obvious signs. Special attention should be called to this type by men of such an assembly as this, so that they may be continually brought to the attention of the general practitioner. This latter variety does not include those of the Bezold type, in which the swelling is on the inside, and equally obvious from its own peculiar symptoms of headache, stiffness of the jaw and neck, and deep tenderness around the tip.

The symptoms mentioned by Dr. Crockett and others, of a discharge too profuse to be attributed to the tympanum alone, has long been a guiding symptom in our hospital. If the discharge is copious enough to run from the canal and stain the pillow, especially at night, or to necessitate frequent changing of cotton wicks, it is evident that it must come from the antrum or some of the contiguous cells. If the walls at the periphery of the drumhead are prolapsed, with a scanty discharge, without pain or temperature, it may mean that the mastoid is involved or may not. These cases require constant watching and careful observation, so as to be sure of a definite diagnosis, especially in absence of all the classical symptoms.

There is one symptom which I have not seen mentioned, and that is transient pain coming in the middle of the night for a short time only. The first night perhaps for fifteen minutes, about eleven o'clock or perhaps up to one o'clock, when the discharge is more or less copious. The next night or so it may last for half an hour, and if allowed to go on it may increase up to two or three hours. This nocturnal pain I have found in a great majority of cases to mean that the mastoid operation will be inevitable sooner or later, and it can usually be depended upon to drive the reluctant patient to accept operation. I have found the mastoid always to be involved in these cases, but if it is opened early there may be scarcely any evidence of true pus, except by microscopic examination, and if opened later there may be only one or a few separate foci at the purulent breaking point.

Elevation of temperature is by no means always present, even with the mastoid full of pus, and when present means absorption, so that the frequent remark of the general practitioner, that there can be no trouble because of no temperature, shows that he is not conversant with this fact. The rule lately laid down by Uchermann, although not specially new, is a good one to follow, namely, that in acute suppurative otitis media, if temperature lasts up to the eighth day, despite frequent paracentesis, the mastoid should be opened, even in the absence of tenderness over the process, or other classical symptoms.

Dr. Leland cited the case of a lady who had a thickened perforated drumhead with profuse discharge, with red, slightly swollen periphery, who was not confined to the house, but who had been treated for two years for the relief of the discharge without effect. Classical symptoms were entirely absent, although pressure elicited slight pain. This, however, is not conclusive, because deep pressure over the normal mastoid will sometimes cause pain. Finally, in order to get rid of the discharge, operation was submitted to. The outer cortex was found to be about a quarter of an inch thick, hard and white, but the inner table was destroyed over an area as large as a quarter of a dollar, and granulations covered the dura and sinus, a large area of the inner cortex being absent. There were the socalled protective granulations which saved the patient from extension inward.

This condition of affairs may be found, even in acute cases. In another recent case, a man of about thirty-five years of age had had measles two months before, but came into the hospital complaining of slight pain, especially at night, and slight discharge. There were no other external symptoms. Upon operation the mastoid was filled with much thickened granulations, which caused extensive absorption of the trabeculæ, more or less complete, and the inner cortex was largely absent. It seemed strange that this should have taken place in two months, although it only emphasizes the destruction which may sometimes occur as a sequel of measles.

Dr. Leland has not had much success with the X-ray, perhaps because his experience has been limited or unfortunate.

He congratulated Dr. Crockett upon his first case as detailed. We can all appreciate the immense satisfaction such marked success with a difficult diagnosis and favorable result brings.

He did not agree with Dr. Crockett that leucocytosis is a late symptom. It is sometimes noted early in the disease. He cited a recent case in which acute epidemic tonsillitis was accompanied by acute middle ear disease. Multiple incisions were made in the drumhead on two different occasions, after each of which the temperature subsided. There was no redness nor swelling nor tenderness over the mastoid process, the only sign of mastoid involvement being that the discharge would not cease, nor the drumhead heal. Temperature began to rise with the drumhead well open. Case began April 29th. First paracentesis was made May 3d, with relief of all aural symptoms, except considerable serous discharge. On May 12th, slight increase of temperature, and 14,000 white blood corpuscles. On the 15th, slight pain on pressure on the mastoid, but no other symptoms. Paracentesis gave no relief. On the 16th the temperature rose to the vicinity of 103°. Pain appeared, and tenderness in the left ankle, and at about six-hour intervals were involved the left knee, then the right ankle, the right knee, and the left wrist, the right wrist, the right elbow, and the left elbow, together with slight pains in both hips and shoulders, with temperature of about 104°. Blood culture was negative. Discharge from ear showed streptococcus, and from the throat strepto- and pneumococcus.

This was a very pretty case of acute articular rheumatism. The tonsils had been burned down to stumps in the city of New York, one, however, having a slight amount of cheesy detritus only. It was concluded that the mastoid was the only source of infection. The blood count showing 14,000 whites with 83 per cent of polymorphonuclears. On the 18th the mastoid was opened, and although no distinct pus was observed, the culture showed streptococcus, staphylococcus and pneumococcus, with microscopic evidence of necrotic bone. The inner cortex was somewhat softened, the sinus wall slightly opaque and smeared with a thin exudate, easily wiped off. The sinus was opened and the flow very free; plugged above, there was copious bleeding from below, and plugged below, only slightly greater flow from above. On the next day the joints began to subside, and on the 20th, although the whites were still 14,000, the polymorphonuclears had diminished to 79 per cent, and the case went on to rapid recovery without incident. For this case and some of the notes he is indebted to Dr. A. K. Paine. It might be observed that here we had to do with a case of bacteremia rather than septicemia. Blood culture and counts were by Dr. G. P. Sanborn.

Mastoidalgia has been mentioned by Dr. Harris, and he would like to call attention to the fact that in these cases sometimes is found a large swollen and inflamed condition of the posterior pharyngeal lymphatic band running up behind the posterior faucial pillar. In this case there is also apt to be pulsating, low toned tinnitus, when it will be found that this swelling involves also the region of the eustachian tube, usually without involvement of the ear or diminution of hearing. Strong astringents applied to this band will usually clear up the symptoms.

Dr. Leland congratulated the society on the excellence of the papers presented, and hoped that they would call attention to obscure forms of mastoid disease which may lead to dangerous complications, so that backed by the weight of the opinion of this society, so many of these cases may not be allowed to go on to dangerous or fatal complications.

Dr. Ewing W. Day, Pittsburg, said the fact that no symptoms are present at the time when the patient is examined does not signify that there were none previously. If it were possible to follow a case from the beginning, symptoms would probably be found at some time in the course of the disease. In this class of cases, when the mastoid is opened the disease is found to have extended to the dura. The very fact that it has extended to the dura accounts for the absence of pressure and symptoms at the time the patient presents himself. These are the most dangerous cases.

He had never been able to derive any information from the blood count in mastoiditis limited to the bone. The effect upon the blood stream from bone absorption is almost nil in such cases, and when the blood stream is affected the disease has progressed beyond the mastoid.

He had had X-ray pictures made in several cases, and whether it was the fault of the plates or of his inability to read them, he did not know, but they had been of no assistance to him.

Dr. S. J. Kopetzky, New York, held that in classifying these cases as atypical mastoiditis, if one excludes those so classed because of a strictly anatomic basis, and considers the rest of these cases from the clinical standpoint, that then one will find symptoms commonly present in each group and significant for each clinical group. For example, the atypical mastoiditis caused by an infection of the pneumococcus, shows an invasion which subsides in one portion of the invaded area only to light up later in another section. The middle ear may be entirely normal by the time the lesion is evident in the mastoid process proper. This is atypical of the general run of a mastoiditis, but it is typical enough for a pneumococcus invasion of the middle ear spaces. Other examples of groups of cases acting alike under similar conditions of infection might be cited to substantiate this contention.

Regarding the case cited by Dr. Barnhill, the character of the invading organism is not given, and so one cannot say whether or not the case presented data characteristic of a class to which it might have been found to belong.

In regard to the cases of socalled "latent mastoiditis," it would be of moment to study what takes place in the cases of mastoiditis in which resolutions occurs. Dr. Barnhill says his case was one of latent mastoiditis of seven years' standing. The speaker doubts the latency of the disease for such a period, and called attention to the following: In the first place, in cases clinically nothing more than purulent otitis media, it has been observed that the cells in the mastoid process are filled to a lesser or greater extent with pus. This is so even when there are absolutely no signs of mastoiditis present. Furthermore, in cases of fully developed mastoiditis giving classical symptoms, and in which resolution takes place (as it often does), the tympanic cavity eventually becomes dry, the drum healing. The changes taking place within the cortex are of moment in this discussion. The bony intercellular walls which are in part destroyed are not reformed. The disintegrated mass becomes partly absorbed and mostly organized by the growth of blood vessels and connective tissue. The case is then cured, and the patient cannot be said to have latent mastoiditis. In this given case the patient is in a similar status to the one upon whom a simple mastoidectomy had been performed and the wound in the mastoid process had become filled up with granulation tissue and the skin and periosteum had grown over and covered the wound area. An invasion by microorganisms, seven years later, might in all the above examples, or in any one of the incidences, set up an acute infection of the middle ear spaces and produce a profound disintegration of the granulation connective tissue in the mastoid process. In the resolved case it is no more the manifest stage of a long drawn out latent mastoiditis than it is in the breaking down of the wound area in the case operated in. To the speaker's mind the latency of Dr. Barnhill's case bespeaks resolution, and seven years later there was an acute infection with resultant acute mastoiditis.

Dr. Kopetzky did not believe that suggestion had so much to do with affording the relief where operation was undertaken in cases of mastoidalgia, nor did he believe mastoidalgia to come within the classification of atypical mastoiditis. He thought the relief was obtained because the nerves in the periosteum were severed during the operation, and suggested that in such cases operative procedures might be limited to incision and retraction of the periosteum where there was no pus in the mastoid process.

Dr. Kopetzky, replying to Dr. Beck, said that since Dr. Beck questioned his statements, he took the liberty of placing the factors upon which they were based before the meeting.

That pus invades all the cells of the mastoid process in cases which we are habitually diagnosing as acute otitis media purulenta from the clinical standpoint, is borne out by the investigations of Politzer and Bezold, and especially by the work of Boenninghaus. Radiograms of such cases which give no mastoid symptoms at all, and which are in no sense to be considered as mastoid cases, show, when compared with radiograms of the opposite ear, the distinct general cloudiness which, correctly interpreted, means pus within the cells. In the other cases, according to Bezold, in 9 per cent of the cases the bone of the mastoid process becomes involved in a destructive process which Boenninghaus has termed an "ostitis rareficans simplex."

The destruction of the walls separating the cells within the mastoid process, and the changes which occur after resolution sets in, whereby the larger spaces caused by this bone absorption is filled in with granulation tissue, was described in 1904 by Scheibe.

Boenninghaus, citing Scheibe, states that while some bony deposits may follow in the usual way from osteoblasts, this is only a very limited process. The radiograms of acute mastoiditis, and the study of the pathologic findings on the operating table, further substantiate these observations and contentions.

Dr. Walter A. Wells, Washington, mentioned the case of a physician who was visiting another physician in Washington, and who had been having some indefinite trouble with his ear. Though the trouble had existed six weeks, there had never been any sign of suppuration, no pain, except at the commencement, no severe headache. He had been under the care of several physicians in New York and elsewhere, but no one had suggested a mastoid involvement. When the speaker first saw the patient there were beginning to appear symptoms over the mastoid process. He could hear only at ten or twelve inches a watch that ordinarily he could hear at thirty inches. As the drum membrane looked suspicious, paracentesis was made, but no pus appeared. In a day or two there was a little discharge, which proved to be staphylococcus, with a few chains of streptococcus. With the appearance of the discharge the edematous condition over the mastoid disappeared. The physician whom the patient was visiting discouraged operation. The speaker operated, however, and found the mastoid tip absolutely rotten. The cortex covering the antrum was very thick, but the entire tip was broken down completely. The patient had lost ten or fifteen pounds, and was extremely prostrated before operation. This prostration will often guide one to a considerable extent in deciding whether to operate.

Dr. Max A. Goldstein, St. Louis, said there had been many references to atypical cases in which there was a dearth of symptoms, and in which destruction proved to be extensive. He presumed that if these cases had been examined bacteriologically they would have been found to be tubercular. He had reported three cases in which tubercle bacilli were demonstrated in the pus and granulations. The bacillus tuberculosis, the bacillus mucosus, or some other slow-working bacillus, is undoubtedly present in that class of cases which are so atypical in variety.

Dr. Stucky, in closing the discussion, said he had seen two cases of atypical mastoiditis in children under two years of age, in which there were absolutely no symptoms at all until the patient had convulsions. There was a little bulging behind the ear in one case, which, when opened, proved to be an epidural abscess.

He had reported one case of traumatic mastoiditis. He had also had tuberculous cases, in which there were tuberculous glands behind the ear, with no history of middle ear tissues.

The exploratory operation, which Dr. Allport did not understand, meant the same thing to the otologist who opens the mastoid as to the abdominal surgeon who opens the abdomen.

He would have been glad if Dr. Leland had accounted for the nocturnal pains to which he referred.

He did not agree with Dr. Day with reference to absorption. If the abscess is walled off there may be no absorption, but a blood count taken twice daily will give indication of trouble.

XVI. The Socalled Conservative Mastoid Operations, With a Description of the Technic of Heath, Bondy and Siebenmann.*

BY GEORGE L. RICHARDS, M. D.,

FALL RIVER.

DISCUSSION.

DR. W. SOHIER BRYANT, New York. We have heard discussed the technic and details of the modified radical operation with the preservation of the drum membrane and the ossicles, which has become almost universally identified with the name of Charles J. Heath, the English author, who is generally accredited with being its originator. It may be of some interest in this connection to know that to America, rather than to England, belongs the credit of priority in using and demonstrating this improved method of operating for chronic otorrhea. As early as November 28, 1905,[1] it was my privilege to present at the meeting of the New York Otological Society a case upon whom the operation had been successfully performed on July 27, 1905. An account of this operation appeared in the *Archives of Otology,* February, 1906, while Heath's[4] article was not published in *The Lancet* until August 11th of that year (1906). Heath's work was done in June, 1906, while mine dates back to 1905.

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*See September number, page 578.

It was furthermore my pleasure to make two other presentations of the operation, both of which antedate any recorded work of Heath's:

(a) At the meeting of the New York Otological Society, January 23, 1906.[2]

(b) At the meeting of the Section on Otology, New York Academy of Medicine, April 12, 1906.[3]

I want to distinguish between the conservative radical and the modified radical mastoid operation. In the conservative radical the ordinary Schwartze-Stacke operation is carried as far as removing the ossicles and the tympanic membrane, but the inner tympanic wall is not curetted, nor is the eustachian tube closed. In the modified radical operation the ossicles and the drum membrane are retained. I performed a modified radical operation on September 14, 1904. The case was presented before the New York Academy of Medicine, Otological Section, on March 9, 1905, and appears in the *Archives of Otology,* Vol. xxxiv, No. 3, June, 1905.

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Dr. J. A. Stucky, Lexington, had performed the Heath operation three times and in each case had subsequently to do the radical operation. He did not believe that any results could be obtained from the Heath operation that could not be gotten from a thoroughly performed classical operation. He had examined some of Heath's patients from two months to three years after operation. Two cases he had examined twice. In two the results were ideal; in the others the drum membrane was still soggy.

Dr. Frank Allport, Chicago, felt as Dr. Stucky, Dr. Barnhill and others do, that as a rule the Heath operation is merely a makeshift—it does not get at the seat of the trouble. He did not mean to say that there are not some cases which will be cured by the Heath operation, but the question is, is it a wise and proper surgical procedure in the vast majority of cases of chronic purulent otorrhea of an intractable nature? Almost all of these cases are accompanied by necrosis of the antrum, middle ear, ossicles, attic and usually the mastoid cells down to the tip. The Heath operation does not interfere with the attic, or the ossicles, or the tympanic walls, or the end mastoid cells. The operation practically merely consists in opening the antrum and thereafter depending upon irrigation and drainage to complete the cure. The operation, therefore, cannot appeal to one's surgical sense, and can only cure a few cases where operations of any kind are indicated. It may possibly be that this operation should be tried in exceptional cases, such as those mentioned by Dr. Beck, in which both ears are diseased, or in children where we can depend upon the natural resources of the body to go a long way towards the production of a favorable result. Even in those cases, however, the wisdom of the Heath operation is not by any means established. Its position seems to be getting less secure as time and experience outline the boundaries of its usefulness. Dr. Allport felt that, after all, if an operation is to be done at all, it is better to do thorough work, to get at the real seat of the trouble and to perform the classical radical mastoid operation.

Dr. Allport was interested to hear what Dr. Stucky had to say about his ossiculectomies. He remembered that some years ago Dr. Stucky spoke valiantly before this society in advocating ossiculectomy for chronic purulent otorrhea. He remembered that about a year ago Dr. Stucky, with his natural honesty, declared again in the halls of this society, that he had been compelled to subsequently supplement all of these ossiculectomies by the radical mastoid operation. Dr. Stucky also some years ago was quite warm in his praise of the Heath operation, and now he comes before us and admits that most of these operations have had to be reoperated by the radical mastoid operation. Dr. Stucky is a good operator and an honest man, and I believe that if every one were as honest, the Heath operation by this time would be considered an unwise procedure and would be relegated to almost oblivion. The classical radical mastoid operation, in the speaker's opinion, is the operation, and all who try to escape it will be compelled, sooner or later, to return to it, unless some procedure which we know not of at the present time is discovered.

Referring to the flap, he said that he believed the simplest and the best one that can be made is the Panse L flap instead of the Panse T flap. In the Panse L flap the incision along the diameter of the meatus is made as close to the bottom of the meatus as possible, and all of the meatal tissue is thereby thrown into the upper flap, which is unquestionably the region where the transplantation of tissue is most desirable. This flap can be beautifully and simply made by using the meatal divulsors, which are for sale by Mueller, Hardy and others. By forcing the blades of the divulsors apart the meatus is put on the stretch, and the lower arm of the divulsors being used as a guide for the knife, the incision is easily and accurately made.

Dr. Arthur B. Duel, New York, had not had sufficient experience with the three operations under discussion to speak convincingly concerning them. They involve, however, several surgical principles which are interesting.

For a number of years practically all otologists considered a chronic discharging ear which had resisted the usual measures of cleanliness and hygiene as a menace to the patient, which should be operated upon in order to stop the discharge. The length of the time in which these measures should be employed before operation was resorted to varied, according to the views of the operator. All such patients were looked upon as being in a precarious condition. When the radical operation was suggested, and it became known that it would cure the majority of these cases, this was the procedure which was advised, and surgeons continued to operate, some with a technic of their own, others with the technic of someone else, and the variations in method were discussed as to their relative merits. Finally it was discovered that simpler process would cure the disease in a number of cases. Then came the discussion of ossiculectomy, and the comparison of the two methods. They represented each a different class of cases,—one class which could be cured by ossiculectomy, and the other which could be cured only by radical operation. Naturally, in the cases which were cured without ossiculectomy the hearing was better than in those where this was resorted to.

There are many chronic suppurative cases in which there is no necessity for continuance of treatment by hygienic measures, and in such cases the radical operation should be advised. These are the cases of cholesteatomata, and where functional examination shows that there is fistula leading into the labyrinth, or where there is found to be decided necrosis or caries of the ossicles, internal wall of the antrum, or the aditus ad antrum. Other cases, with large central perforation, with profuse discharge, and with stoppage of drainage, can undoubtedly be cured by a less radical operation than exenteration of the middle ear, destruction of the ossicular chain, and loss of hearing. Experience had taught him more and more each year that many cases can be cured by drainage from the middle ear through a posterior operation, leaving the drum membrane and ossicles intact. Some method of posterior drainage, leaving these structures in place, would succeed in reducing the number of cases of radical operation one-half.

SATURDAY, JUNE 3D.

RECENT ADVANCES IN THE TREATMENT OF DISEASES OF THE EUSTACHIAN TUBE.

XVII. (a) The Pharyngeal Orifice of the Eustachian Tube, with a Demonstration of a Speculum and Other Instruments for the Direct Examination and Treatment Thereof.

DR. SIDNEY YANKAUER, New York, described his direct nasopharyngeal speculum and intratubal speculum. He first experimented with straight tubes, but finding that these caused injury to the soft palate, which was to be scrupulously avoided, he abandoned the straight tubes. After studying the mathematics of the situation, he devised the instrument which is described in the paper. The work of Gyerygai in the direct examination of the nasopharynx by means of straight tubes was reviewed.

The author's speculum is so constructed that the anterior wall of that part of the instrument which enters the nasopharynx comes in line with the posterior wall of that part which presses against the angle of the mouth, so that it forms a lever having a thickness corresponding to the thickness of the meatal opening. The parts are therefore brought into view with the least possible amount of pressure on the soft palate, so that injury to this structure is entirely avoided.

Cocain is used for the first few introductions of the speculum, and in sensitive patients each time.

The patient sits upright in front of the operator. One side of the nasopharnyx is examined at a time. Attention was called to the difference in appearance and relationship of organs examined by the direct method and by means of reflecting instruments. The anatomic structures in the neighborhood of the pharyngeal orifice, and their behavior under physiologic and pathologic conditions, were discussed.

As the direction of the speculum corresponds to the direction of the axis of the tube, it becomes possible to insert straight instruments into the tube, for the purpose of investigation or treatment. If the interior be cocainized, it is possible to insert a short straight tube for about 1½ cm. into the eustachian tube. The intratubal speculum is used for this purpose.

Pathologic findings in and about the fossa of Rosenmüller were next discussed. Six cases were cited in which there was excessive secretion in the fossa of Rosenmüller. All patients complained of marked tinnitus aurium, but not of deafness. The proximity of the fossa of Rosenmüller to the carotid artery, to the isthmus of the eustachian tube, and to the labyrinthine capsule, led to the assumption that the head noises were due to the breaking of air bubbles or to the movement of the mucus within the fossa. The absence of inflammation in the fossa, and the absence of all evidence of middle ear disease, the drum membrane being normal and the eustachian tube patent in each case, further substantiated this view. The mucus was removed by the irrigation of the fossa, either through the speculum with a straight canula, or by means of the old-fashioned postnasal syringe. After the fossa was thoroughly cleansed out, an application of five or ten per cent solution of nitrate of silver was made to the fossa through the speculum. In four of the six cases the excessive secretion disappeared after a few treatments, given every other day.

With the disappearance of the secretion the head noises ceased completely. In two of these four cases relief was permanent. In the other two the patients returned several times with renewed secretion in the fossa. Relief was prompt and decided in the four cases, the tinnitus being markedly diminished after the first treatment. In the remaining two of the six cases cited, the secretion continued in spite of the treatment, and the tinnitus was not diminished.

XVIII. (b) Examination and Treatment of the Eustachian Tube by the Aid of the Nasopharyngoscope.*

By Edgar M. Holmes, M. D.,

Boston.

DISCUSSION.

Dr. W. Sohier Bryant, New York. I find that the old-fashioned, posterior rhinoscopic method of examining the mouth of the eustachian tube with the mirror is still useful in the majority of cases. As you know, however, at times this method is neither satisfactory nor practicable. A number of adaptations of the cystoscope have been described for exact nasopharyngoscopy and for use in cases where the mirror is unsatisfactory. The instruments are passed through the nose as Valentin's salpingoscope,[3] or through the mouth as Hays' pharyngoscope.[2] The Holmes model of the Valentin salpingoscope is the best I have seen.

I have found Hay's pharyngoscope serviceable in cases where obstruction of the nose prevents passage of the salpingoscope. The transnasal method has one great advantage over all methods via the mouth, in that it permits the inspection of the eustachian orifice in normal motion, which cannot be observed satisfactorily by the other methods.

von Gyergyai's[1] and Dr. Yankauer's instruments are based on quite a different mechanical principle and belong in another class. In cases where the palatal conformation is sufficiently ample to permit their use, they give direct access to the parts and consequently make easy manipulation possible.

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*See September number, page 511.

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Dr. Bryant further said: While in the greater number of cases of middle ear disease, inspection of the pharyngeal mouth of the tube adds but little to the diagnosis, in the lesser number of cases such inspection is of considerable importance, because it reveals unsuspected conditions and fixes the details of previous assumptions. I have found such inspection especially advantageous in chronic obstruction of the eustachian tube, where the cause cannot well be determined without direct inspection of the orifice of the tube. The inspection enables us to determine the seat and nature of the fundamental cause of obstruction, whether in the tube itself, in the fossa of Rosenmüller, the mucous membrane surrounding the tube, the posterior ends of the turbinates, or the adenoid tissue. A doubtful diagnosis is made positive, and sometimes serious unsuspected conditions, such as the existence of malignant disease, are brought to light.

Here again, in the majority of cases, there is no need of knowing the exact conditions existing in the immediate neighborhood of the mouth of the tube, for our knowledge of the general conditions is sufficient to enable us to obtain satisfactory results from treatment. In the minority of cases, however, the local conditions differ from the general, and an inspection of the mouth of the tube enables us to determine the local change that is interfering with the function of the tube, thus putting us in a position to correct it. By means of the salpingoscope or the pharyngoscope, we can ensure the accuracy of local treatment—the application of reagents, operative procedures, or catheterization of the tube. We are thus enabled to apply with the greatest benefit, fulguration or cauterization, to break adhesions and to remove redundant tissue.

Dr. Thomas J. Harris, New York, said the papers of Drs. Yankauer and Holmes represented some of the best work that has been done by the members of this society, the kind of work that the society stands for, namely, original work. It had been a revelation to him to realize how much can be seen by direct examination of the eustachian tube. He had also been surprised to learn of the variety of conditions which affect these parts, and of how much can be accomplished in the treatment thereof by means of direct inspection.

He asked Dr. Yankauer if the intractable cases to which he referred are really unmanageable, or if the difficulties which they present may be overcome by practice.

He would be glad if the gentlemen, in closing the discussion, would tell which is the better method, and what are the advantages of one method over the other.

Dr. Sidney Yankauer, New York, in closing the discussion, said he had never used enough pressure to injure the soft palate by the speculum. The amount of pressure used can be very easily gauged, and it is unnecessary to exert sufficient pressure to cause any traumatism. When he used the straight tubes, he had to pull the palate so much farther forward that he did sometimes injure it, but since he had been employing this speculum, this difficulty had been obviated.

Dr. Holmes' cases of acute otitis media were particularly interesting. He had attempted to treat such cases in a similar manner, making applications of cocain and adrenalin, and of argyrol, to the inside of the tube.

The result of his method of treatment was immediate cessation of the symptoms and recession of the drum, lasting from six to eight hours. · In cases seen early, where bulging is not very pronounced, and where it could not be determined whether the case is going on to suppuration or whether it is a simple catarrhal inflammation, relief was permanent. Where the symptoms were very pronounced relief was only temporary. In a few cases the pain did not return, but the bulging of the drum membrane remained. Such patients were willing to stand the deafness as they were free from the pain, and they perforated in forty-eight hours. These cases healed with a distinct round defect in the drum membrane, closed with thin scar tissue, which is more easily moved with the pneumatic speculum than the remainder of the drum membrane. He felt that such injury to the drum membrane caused a loss of hearing, and so he had ceased to treat acute otitis media by this method.

As to the comparison of his method of examination and that of Dr. Holmes, as suggested by Dr. Harris, none was to be made, each being supplementary to the other. It is quite important in many instances to look into the fossa of Rosenmüller with the salpingoscope, but until one has used the direct speculum it is difficult to realize what a place this fossa is. Sometimes it appears as a mere slit with reflected light, but when the direct speculum is put in, it is found to be quite deep. The treatment of the fossa of Rosenmüller is quite simple, and is carried out with the speculum.

The objection on the part of the patients to the speculum is of no consequence. They say that it does not hurt, but is disagreeable on account of the gagging. One patient, a young man, who fainted the first time the speaker tried to pass the eustachian catheter through the nose, after a few trials permitted him to pass the direct speculum without cocain.

Dr. Holmes, in closing the discussion, said Dr. Yankauer's statement about not being able to see the fossa of Rosenmüller was true of the pharyngoscope, but not of the speaker's instrument. The fossa can be seen in its normal condition, and can be operated upon when necessary.

He said the salpingoscope of Balentyne was one effort in the right direction, but it was not neatly designed. Patients do not object to the introduction and manipulation of the nasopharyngoscope. He used it in a child two and a half years old. Children do object to the light, so that it is better to introduce the instrument before lighting it.

In his first fifty cases he had found one growth in the tube. He removed it and presented it at the Boston meeting of this society, and he had seen but one growth in the tube since. In this series of almost 1,000 cases this would be two-tenths per cent. These statistics were not convincing, and he simply gave them as he found them.

In treating the tube by this method there is no staining with blood, as in the old method of treating the tube blindly.

The secret of success with this method is the avoidance of traumatism to the tube. The instrument enables one to treat the tube easily, unless there is deflection sufficient to require nasal operation.

XIX. (c) A Report of Twelve Cases Operated Upon by the Yankauer Method for Closure of the Eustachian Tube.

DR. SAMUEL McCULLACH, New York, discussed the advantages of this operation, the class of cases to which it is applicable, and the method of anesthesia employed, and briefly reviewed the histories of the twelve cases treated by him according to this method.

The cases were of two classes—those in which a radical operation had been performed, and those in which no operative treatment had been undertaken. Of the two cases in the first class, one was cured and one improved. Of the nine remaining cases, three were cured, five were improved, and one was classed as unimproved, the patient having passed from observation.

This gave 33 per cent cured, 56 per cent improved, and 11 per cent not improved. Of the three cases cured in the second class of cases, the time elapsing between the operation and cessation of the discharge was, six weeks, four weeks, and six weeks. Of both classes, 36 per cent were cured, 55 per cent improved, and 9 per cent not improved. Eliminating the case that was lost sight of, 40 per cent were cured, and 60 per cent improved. In the cases noted as improved, all so classed have expressed their satisfaction at the results of the operation.

Conclusions could not be drawn from so limited a number of cases, but the results obtained had convinced the reader of the paper that the method is a valuable and simple procedure, which eliminates the necessity for radical operation in a certain percentage of cases.

DISCUSSION.

DR. SIDNEY YANKAUER, New York, wished to emphasize certain points with reference to the indications for this operation. Consideration of the pathology of chronic suppuration would lead to a realization of the fact that all cases originate in diseases of the nasopharynx, and that where the disease has existed as long as in many of the cases just reported, various pathologic changes have taken place in the middle ear and mastoid cells. Some of these changes are very slight, while in others they are of greater severity; that there may be slight changes in the ear, necrosis in the attic, disease of the mastoid cells, collections of pus around the sinus or in the subdural space, etc.

In order to cure chronic suppuration two surgical factors are necessary: first, to drain the purulent area, and second, to prevent reinfection. Reinfection taking place through the nasopharynx must be prevented by preventing the entrance of the germs through this region. This may be accomplished in various ways. An autogenous vaccine may be used; if properly made and employed, this will destroy the kind of germs from which it is made wherever they may exist in the body. But there is no way of knowing that a new infection will not arise. The only way to prevent such a contingency is to close the eustachian tube. The necessity of closing the tube in this class of cases is shown by the improvement which follows this procedure. When the radical operation is done the tube can be easily reached. Just as in the radical operation it is necessary to close the tube in order to secure healing of the parts, so it is in other cases. In all the minor operative procedures which can be carried out through the canal, success will result if the tube is closed. Whatever the form of treatment the closure of the eustachian tube is a necessity. This should be the first thing to be done. His own experience has shown that a certain number of cases will be cured by simple operations on the middle ear, others will always require radical procedure.

Dr. McCullagh had not succeeded in inverting the tube; that is not necessary. The speaker had failed to accomplish this in a majority of cases. In doing this large curettes should be used first, to be followed by the use of smaller curettes for cleaning out the angles.

Dr. Norton L. Wilson, Elizabeth, had had several cases cured by this operation, two of which he desired to report. The first had been under observation for over two years. The Heath operation was performed, without improvement; autogenous vaccine was employed for three months, and still the suppuration continued. After the Yankauer operation a permanent cure resulted. In the second case the ear had been discharging for years. This was checked by the operation under discussion. Hearing was diminished, and the patient, who was neurasthenic, constantly complained of a sense of fullness in her ear, for relief of which she made insistent demand.

Dr. S. J. Kopetzky, New York, said the technic of the operation is very simple and easily performed. He has employed the method in nine cases, only one of which was cured. In two others the results were doubtful, because although they became "dry," the result was not free from suspicious circumstances in that they all had had previous periods of varying duration, during which they had been "dry." In six other cases there was no effect noted from the Yankauer operation. It was only fair, however, to add that these six cases had been selected cases in which no cure was to have been expected by anything short of the radical mastoid operation. They were submitted to this operation (the Yankauer) because they came within the range of indications for it as laid by Dr. Yankauer last year, which the speaker then thought were far too sweeping.

The speaker thought that Dr. Duel had struck the true keynote in his discussion yesterday, when he intimated that all these procedures have individual value in given cases, and one is not a substitute for the other. The Yankauer operation is not a substitute for the radical mastoid operation, although from the reports given this morning, where ossicles were removed, the tympanum curetted, and the eustachian tube closed, the speaker failed to see wherein the Yankauer operation as now advocated left the patient in any different status than he would be were a limited Stacke operation performed, leaving out of account the mechanics of the two procedures.

It was interesting to listen to Dr. Yankauer's advocacy of closing the tube, and Dr. Holmes' of keeping the tube open, in similar groups of cases, and both reporting cures. From a theoretical point of view it would seem that where the tube is kept open and the case cured, that one had succeeded in more nearly approximating the normal physiologic condition of the ear.

Dr. Frank Allport, Chicago, considered the Yankauer procedure another effort to evade the performance of the radical mastoid operation. He desired to commend any procedure which held out the hope of avoiding this operation, but so far such efforts have been unavailing. Several operations have held out hope along these lines, but so far experience and time have demonstrated their uselessness. None of us will ever forget the extravagant praises which were sung for the ossiculectomy operation. Most of us have tried it, and I presume that all of us have been bitterly disappointed, inasmuch as most of these operations have returned to the surgeon for the performance of the radical mastoid operation. Then the Heath procedure, known by its various names, which is in reality only a modification of the Schwartze operation, had its strong advocates, and has some advocates even now; but certainly it must be admitted that at least outside of Dr. Heath's hospital, this operation has fallen very far short of giving the satisfaction which was hoped for it. Most of these cases have likewise returned for the radical mastoid operation. Now we have the Yankauer operation presented to us, and we do not as yet know what the consensus of opinion will be after the lapse of a year or two. At all events it should be tried by those who are willing to experiment in new and untried procedures, and after a while the Yankauer operation will find its proper niche, and we will no longer have to question as to its wisdom and usefulness. Only time, experience and honest trial can determine the rightful position of this operation. Personally, however, the speaker is willing to venture the opinion that it will be only in an extremely few cases where this operation will be shown to be a suitable substitute for the radical mastoid operation. Dr. Yankauer has freely admitted that many cases are not cured by his method and that a certain percentage still have a discharge; and the speaker feels that as long as there is any discharge whatever, something is wrong, and if this discharge persists that the patient will probably have to submit ultimately to a radical mastoid operation. Dr. McCullagh stated that many cases will not be cured by the closure of the tube alone, but that in addition to this an ossiculectomy has to be performed. The speaker would therefore like to ask Dr. McCullagh how much advantage in such cases the method under discussion possessed over the Heath or the modified Schwartze operation? There is no danger in the Heath or the modified Schwartze operation, and if the case gets along well the ossicles are not removed and the hearing is conserved. Where it is necessary to remove the ossicles, it would seem as if the Heath or the modified Schwartze operation would be better than the Yankauer procedure, plus the removal of the ossicles.

All of these operations undoubtedly do some good, but, after all, in the light of our present knowledge, the radical mastoid operation, properly performed, is the only bulwark upon which we can confidently rest.

Dr. McCullagh, in closing the discussion, referred to Dr. Kopetzky's remark concerning the facilitating of a cure by keeping the tube open, as suggested by Dr. Holmes, and said he did not consider that a drum membrane with a perforation approaches the normal.

Replying to Dr. Allport, he reiterated the statement made in his paper, that the method under discussion saves a percentage of cases from the radical mastoid operation. What that percentage is he could not say, but no matter what it is, it is a gain in the conservative surgery of this condition. The operation is so slight that it is really not an operation from the patient's point of view. In the event of failure, the radical operation can be employed.

The operation is intended for chronic cases, where the ossicles are more or less disturbed, and where they have no effect at all upon the hearing. The object of removing the ossicles is solely for the purpose of getting freer drainage and obtaining surgical cleanliness in the cavity.

XX. (d) The Medicoeducational Problem of the Deaf Child.

Dr. G. Hudson-Makuen, Philadelphia. The problem of the deaf child has engaged the attention of physicians and teachers for more than two hundred years, and we are only now approaching a satisfactory solution of it. In the working out of the problem and in the practical application of the theories which have been advanced, the combined efforts of the physician and teacher are necessary because of the many pathologic, physiologic, psychologic and pedagogic points involved. The physician is not sufficiently pedagogic, and the teacher can scarcely be supposed to have the requisite knowledge of the other related sciences, to enable him to prosecute this work alone.

Deaf children differ among themselves as normal children differ, and each one presents a distinct individual problem.

It is the function of the physician to prevent deafness, and failing in this to cure or ameliorate it; and it is the function of the teacher to prevent the natural result of deafness, which is mutism.

Deafness should be carefully distinguished from mere hardness of hearing with its many peculiar and interesting phases. Deafness may be quite incurable, but many forms of hardness of hearing are susceptible to treatment, and subject, if not to cure, to at least marked improvement.

Hardness of hearing for speech is often the result of defective cerebral conditions, which may be improved by education.

Some of the many forms of defects of speech found in children with apparently normal hearing are often due either to a hardness of hearing for speech sounds, or to what has been called mental deafness; a condition resulting in a slight perversion of the cerebral faculties, which sometimes interferes with the interpretation of speech sounds. Children having such defects of speech can best be trained by teachers of the deaf, although, of course, they should be placed in classes by themselves.

XXI. (e) The Practical Value of Lip Reading.

Dr. Max A. Goldstein, St. Louis. Lip reading is not a recently developed aid to the deaf, nor is it a new system of special instruction. The evolution of lip reading as a systematic training, arranged on scientific and phonetic principles, is of more recent origin, and in its present stage of development offers to the deaf and the partially deaf, opportunities for social intercourse which may largely compensate for impairment or loss of such an important sense organ as the ear.

There are two classes of the deaf to whom this course of special training is applicable: the first comprises all types of the congenital deaf who have never heard the sound of the human voice, and the large group of cases in which total deafness has developed before the eighth year, or where the acquisition of speech and language has been forgotten.

The importance to the otologist, as well as to the incurably deaf patient, of a knowledge of the art of lip reading or speech reading requires no discussion. To the partial or incurable deaf the acquisition of lip reading is a manifold blessing. To the otologist it offers a consolation for his inability and impotency to cope with certain forms of aural pathology, and it places him in a position to restore the peace of mind and to instil new hope in his deaf patient.

There is a vast difference in the acquisition and perfection of the science of lip reading by the congenitally deaf pupil on the one hand and that of the pupil with acquired deafness on the other.

The difficulties of acquiring a practical working knowledge of lip reading have been overestimated. Age is no handicap to the acquirement of proficiency in lip reading, if good sight, a fair degree of intelligence and an ordinary vocabulary of spoken language are the assets of the pupil.

The case was cited of a profoundly deaf young woman who, in less than two years, had become equally familiar with German, French and English. The need for experienced teachers was emphasized. The otologists should be able to answer the question, "Where may I obtain such instruction?" To complete the paper the author added a list of special normal schools and private instructors where such training is offered to intelligent, active, patient, observant men and women to perfect themselves as teachers of the deaf.

The principles of lip reading may be mastered in comparatively few months, but the practical value of this art will perhaps be appreciated only after proficiency is attained by considerable practice. A pupil of average intelligence and alertness may master the principles of lip reading in from five to six months, taking two hour-lessons each week. Add to this one year of daily practice for accuracy and speed, and the time of pupil service is completed.

In an endeavor to cooperate in an endeavor to plan a general movement for the education of the public to the value of lip reading as a system of instruction for the deaf and partially deaf, the attention of the medical profession was directed to the opportunities and resources which a knowledge of lip reading may afford this class of people; the specially qualified teachers to the worthy cause in which they may be enlisted; the otologists for the boon which they may confer on that large class of the deaf heretofore so seriously handicapped in carrying out their social and economic functions. All who may be interested in this work should realize that there is no effort in the wide realm of education more heroic or more charitable than the emancipation of the deaf.

DISCUSSION.

PROF. JOHN DUTTON WRIGHT said: I have listened with great interest to the two valuable papers that have just been read. I was delighted with Dr. Makuen's little patient and congratulate him upon what he has been able to do for her. He spoke of his observation that during the last year she had begun to notice sounds to which she had formerly appeared to be wholly deaf. That is a very common occurrence with my own pupils who have, like Dr. Makuen's patient, some slight power of sound perception. The persistent training which they receive in the use of this slight hearing, which can be somewhat accurately described by the term "latent," fixes their attention upon the impressions that are received through it, and gives a significance to sounds that had always reached them perhaps, but had been ignored because they brought no help or information. In the last analysis we hear with our brains, and it is a matter of common observation that when our attention is occupied we actually do not hear sounds about us that are foreign to our thoughts, but ignore them as valueless. We frequently say of these children, "How much more they hear!" Whereas in all probability the actual power of sound perception has not increased, but the brain has been trained to discriminate and interpret the sounds, with the result that ideas are generated.

I most heartily endorse the strong paper read by Dr. Goldstein, and feel sure that much benefit will come to the deaf through the increased interest which otologists are showing in the educational phase of their treatment.

The acquisition of the ability to interpret speech by the visible movements involved in it, with little or no aid from the ear, is surrounded with much the same difficulties as the acquisition of any other intellectual accomplishment. If a profoundly deaf person will put forth the same amount of effort, and spend the same amount of time in the study and practice of the art of lip reading that even an ordinary player on the piano must expend in order to acquire a very moderate degree of proficiency in musical expression and comprehension, he, or she, will reap a much greater reward of personal satisfaction and comfort than the pianist secures. I believe that while there may be some persons who cannot acquire even a moderate skill in music, there is no one who cannot acquire a most useful amount of skill in lip reading. But, just as there are natural musicians, so there are natural lip readers. Some attain it almost without conscious effort, and wholly without instruction. To others it comes slowly and laboriously. The best lip readers are entirely ignorant of the technic of lip reading and the laws of phonetic analysis upon which it is based. But there are other minds that do not seem able to grasp it intuitively, and so must have the anatomic structure laid bare and explained before they comprehend the significance of the visible forms. As it is a purely intellectual process, involving practically no muscular activity, the psychology of it enters largely into the problem. For this reason a cut and dried system of instruction in lip reading is perhaps less applicable to all cases than fixed methods of instruction in most other useful arts. For example, in the case of one individual, the introduction at the beginning of his instruction of a systematic analysis of the phonetic elements of language from a standpoint of visibility and resemblance, may ruin the chances of final success of the pupil, while to another mind it is a necessary preliminary. In general, my own observation has been that the technic of the art should be taught last, and the earliest efforts should be aimed at the establishment of the proper habits of thought and mental attitude toward spoken language.

While it is perfectly true, as Dr. Goldstein has said, that the obstacles to success in lip reading have been sometimes exaggerated, and candidates have been unduly discouraged from undertaking the work, it is also true that people have sometimes been led to expect too much. Owing to the absolute difference in the construction and operation of the eye and ear, they cannot be wholly interchangeable in the performance of their functions. Owing to the fact that the eye must be consciously focussed upon the source of the impressions transmitted by it to the brain, it is impossible for a lip reader to follow a rapidly shifting conversation in a group of people when there is no telling the point from which the next remark may come. For the same reason, owing to the conditions of light and movement at the theater, and to a somewhat less degree at church and lectures, it is impossible, ordinarily, for even an expert lip reader to get more than an occasional phrase or sentence. But by far the greater part of the intercourse of life is or can be individual and face to face, and here lip reading reaches its maximum efficiency.

Dr. Goldstein has touched upon a vital point in his reference to the need of teachers of lip reading scattered throughout the country, and I most earnestly urge upon your attention his very practical suggestion of a way of supplying this need. He urges otologists in various parts of the country to search out promising persons and induce them to go to some training class and fit themselves to teach lip reading. My more than twenty years of service along this line has convinced me that at present no single place of training possesses all that is of value. I believe that there should be such a center, and I believe that this organization could be instrumental in creating that center. I very much wish that your society might choose some bright, wideawake young physician, physically and mentally adapted to the teaching of lip reading, and induce him to enter upon this task, by going to the fountainheads of information on the subject, both in this country and in Europe, with the understanding that when he had gathered all that is worthy of adoption he should establish himself in some centrally located city, where, under the patronage and with the endorsement of this powerful organization, he could become the nucleus of a school exclusively devoted to the training of teachers of lip reading in whom the medical profession could repose the greatest confidence. It would be perfectly feasible for the members of this society to send him an adequate number of students for training, each of whom would pay a reasonable amount for the course, and on their return to their respective communities you gentlemen would easily be able to supply them with a satisfactory number of pupils.

It would give me pleasure to cooperate with a committee of your society, and to examine and test, in the light of my knowledge of the requirements, any young men that the committee might have under consideration for the task, and share in the planning of the course of preparation for the work. I believe that through the co-operation of your society an institution could be established that would gradually come to be of great usefulness and importance. I hope that you will either appoint a committee or instruct the present existing committee to consider the feasibility of this suggestion and report at some early sectional meeting.

If this report should be favorable, you could then give the matter such publicity as would bring applicants for the work, from whom you could choose the one that seemed best fitted to undertake it. The members of the society would naturally reserve to themselves the privilege of nominating candidates for the training, and the institution might be known as "The Trilogical Training School for Teachers of Lip Reading."

Dr. B. R. Shurley, Detroit, heartily approved of the presentation of this subject before the society at this time, and of the spreading of information to the profession at large concerning this important problem. As the internist has busied himself with the problems of tuberculosis, and the ophthalmologist with that of ophthalmia neonatorum, so the otologist should devote his attention to the question of the deafmute. The society and other similar organizations could accomplish an enormous amount of good by the dissemination of knowledge concerning the care and development of deafmutes. Of the schools for the teaching of the deaf in the United States, only four are located in the West, and none in the South. Practically all deafmutes could be taught by the oral method, yet only about twenty per cent of them receive such instruction at the present time.

The value of lip reading in cases of otosclerosis is not duly appreciated. Many such cases leave the otologist with practically all hope gone. This should not be so; the otologist should be able to give some hope of instruction which would lead such patients to greater usefulness. The problem of teaching the deaf in the large cities should be developed thoroughly. One method of disseminating knowledge on this subject is through the state medical societies. Papers embodying the essential facts and the most progressive ideas on the subject would accomplish a great deal.

Dr. Makuen, in closing the discussion, expressed hearty sympathy with the motion just passed, and also with the remarks embodied in Dr. Goldstein's paper. He was looking forward, however, to a broader work than that suggested, a movement which would include defects of speech. He considered it of great importance to correct defects of speech, of which deafness is one of the causes. He would like to see a training school started for the training of teachers for the correction of defects of speech, including the training of the deaf and lip reading.

Dr. Goldstein, in closing the discussion, emphasized the fact that this work is as much the duty of every member of this society and of all otolaryngologists as it is of the few who have given up more or less of their time to it.

NEW YORK OTOLOGICAL SOCIETY.

Stated Meeting, January 24, 1911.

JAMES F. MCKERNON, M. D., IN THE CHAIR.

DR. EMIL GRUENING read the following

In Memoriam, in Honor of Dr. Charles J. Kipp,

of Newark, N. J.:

Dr. Charles J. Kipp died of pneumonia, after a brief illness, on January 13, 1911.

Dr. Kipp was born in Hanover, Germany, October 22, 1838. He came to the United States at the age of sixteen, and was graduated from the College of Physicians and Surgeons, New York City, in the class of 1861. Shortly after his graduation he joined the army as assistant surgeon, and served throughout the war. In 1864 he was promoted, with the brevet rank of lieutenant colonel. He resigned from the army in 1868, and devoted himself to the practice of diseases of the eye and ear. Settling in Newark, he attended the Out-Door Department for eye and ear diseases at St. Michael's Hospital. Later he founded the Newark Eye and Ear Infirmary, where he filled an active position until his death.

Though living at a distance, he regularly attended the meetings of this society, and took an active part in its proceedings.

His sterling qualities and painstaking care have endeared him to the community at large.

The medical profession bestowed upon him the highest honors. He was at one time president of the Medical Society of the State of New York, he was one of the vice-presidents of the American Medical Association, and from 1897 to 1898 he was president of the American Ophthalmological Society. One year later he was president of the American Otological Society.

His contributions to medical literature were numerous and valuable. He was the first to observe that otitic thrombosis of the lateral sinus was frequently accompanied by optic neuritis.

The society loses in the death of Dr. Kipp one of its charter members, one of its staunch friends, and an experienced and indefatigable worker.

In commemoration of his useful life this record is spread upon the minutes of the society.

Dr. Philip D. Kerrison presented a case of

Labyrinthine Fistula

with gradual recovery from a circumscribed suppurative labyrinthitis. The patient, a woman 35 years of age, had suffered from left chronic middle ear suppuration of many years' duration. When she first came under observation two months ago, the condition of the left ear was as follows: Left membrana intensa and Schrapnel's membrane were practically destroyed; inner wall of tympanum partially covered by epidermis; hearing very markedly impaired; caloric reaction absolutely negative. Under careful cleansing treatment the hearing has gradually improved and the caloric reaction has returned to practically normal. She gives, however, a very positive response to the fistula test—i. e., compression of air in the left meatus causes very marked rotary nystagmus directed toward the opposite (right) side.

The case is presented as a rather unusual picture of circumscribed labyrinthitis with fistula in which apparently the membranous labyrinth has practically recovered function.

DISCUSSION.

Dr. Gruening thought the case showed that if the vestibular apparatus does not functionate one should wait. According to the Vienna school this would be a case for immediate operation.

Dr. Duel thought it possible to elicit the fistula symptom in cases where there was absence of the caloric reaction and complete deafness. The fistula test, as Dr. Rae had pointed out, was possible only in the presence of a functionating vestibular nerve. The current passing over the vestibular apparatus in the fistula test, produces a single movement of the eyes in each direction from alternate compression and decompression, whereas the current set up by the heat or cold of the caloric test being continuous caused repeated vestibular movements in one direction with oculomotor recoveries in the other. The fistula test could be elicited while the patient is under an anesthetic. The fistula symptom often remains for some time in cases where a diffuse suppurative labyrinthitis is taking place, and it is often possible to get it when the caloric reaction is absent.

This is due to the fact that strong pressure was capable of producing a movement of the fluid in the canals, where the disease had so altered the contents that conviction currents would not be set up by heat or cold, as employed in the caloric tests.

Dr. Duel said if the radical operation is resorted to in such cases, great care should be exercised to prevent trauma of tissue. Radical operation with hammer and chisel might by the necessary concussion set up diffuse labyrinthitis. He thought the case a subject for radical operation without undue trauma, and without interference with the labyrinth itself.

Dr. Kenefick said Neumann taught that in cases of suppurative labyrinthitis where the hearing disappeared rapidly operation should be performed, but where theh hearing improved operation should not be resorted to. In Dr. Kerrison's case the hearing improved.

Dr. Kerrison added that Barany of Vienna had observed or collected the records of a large number of cases in which the fistula test had shown positive reactions and which came later to operation, and in not one had the fistula been found absent.

Pain Over the Mastoid.

Dr. Stephen H. Lutz related the history of a nurse at the Brooklyn Eye and Ear Hospital, who for over a year had been complaining of pain over the left mastoid. About a month ago the pain became very intense, and there developed a temperature rising as high as 102 degrees in the afternoon and evening, and continuing through the night. There was slight bulging of the posterior superior wall and extreme tenderness over the tip of the mastoid. After about a week with no improvement, he opened the mastoid and found a sclerotic mastoid with two small cells just over the tip filled with pus. There was nothing in the antrum. Because of these findings the external wound was closed. In five days the dressing and sutures were removed, and four days later the wound was absolutely healed. She had pain for about three days more, and it then disappeared. Apparently there was not enough to warrant operation in this case, and he wondered if he was justifiable, in view of the persistent temperature, in operating. The character of the pus from the cells was unknown, as unfortunately the smears were lost. The blood count was normal.

DISCUSSION.

Dr. Dench said there is abundant evidence to prove that in very mild otitis media the infection may spread to and over the mastoid cells and yet the otitis subside without operation.

Dr. Duel, referring to the question of blood counts, spoke of an interesting case which had recently come under his observation at the New York Polyclinic Medical School and Hospital, which showed the fallacy of depending upon this aid in certain conditions. The patient was an Italian laborer upon whom he had operated for mastoiditis, and who returned to the hospital with a chill and high temperature. He was kept in the hospital for forty-eight hours, during which time he had two or three vascillations of temperature from normal to 105 degrees. A blood count, made on the second day, showed whites under eight thousand, but owing to the septic appearance of the patient, and the fact that he had chills and a septic temperature, it was decided to operate. The speaker uncovered the sinus and ligated the jugular, finding a clot which extended down into the bulb. The clot was not examined. For four or five days after the operation there were wide vascillations of temperature with all the evidences of extension, perhaps, to the petrosal. Another blood count showed whites under eight thousand. The patient eventually recovered. The polymorphonuclear percentage was seventy.

Dr. Dench held that with a low white blood count a polymorphonuclear count of seventy is high. A negative differential count in sinus thrombosis was of no value. The temperature, pulse and appearance of the patient were the indications for operation. In the presence of low resistance and a septic condition, operation should be resorted to, no matter what the count shows.

Drainage of Labyrinth With Hearing Existing After Two Years.

Dr. E. B. Dench presented a case of labyrinthine disease in which he had drained the labyrinth thoroughly through the horizontal semicircular canal. Contrary to expectation, after two years the patient was found to have considerable hearing on the affected side, and to react to the turning test. The case proved that in a certain number of instances draining the labyrinth does not destroy hearing. He took off the vestibular end of the horizontal semicircular canal and then removed a layer of bone between the oval and round windows. He drained the cochlea but did not destroy the modiolus. The patient was rotated with the head erect. He had normal reaction on the side on which the labyrinth had been drained.

DISCUSSION.

Dr. Gruening held that the patient certainly had a cochlea, as it had been decided that one cannot hear without it, and he also had a vestibule.

Dr. Duel said with the vestibule, cochlea and the horizontal semicircular canal destroyed it was unthinkable that there would be hearing. If there is hearing there must be a cochlea. It was impossible to preclude the possibility or probability of hearing coming from the other side without some apparatus which would eliminate that in the test.

Dr. Dench said the rotation test was quite independent of the other side. One labyrinth was made minus and the other plus. The patient must react from the vestibule which is being tested. With the Barany apparatus one might get some bone conduction, and with one ear plugged and the other open, the conduction through the eustachian tube was enough to give hearing. The labyrinth was absolutely dead in this case.

Dr. Duel said he had had cases with complete loss of function of one labyrinth in which it was possible to get a reaction (after-nystagmus) in the horizontal plane equally well after whirling in either direction. He considered it much easier to explain the fact that Dr. Dench's patient had after-nystagmus nearly as much on one side as the other by the fact that it is a compensatory reaction. This would seem more rational than to record the fact that a semicircular canal which had been destroyed was now functionating. One might as well say that a man with one eye had binocular vision because he had compensated for his loss well enough to judge distance accurately.

Streptococcus Capsulatus in the Blood.

Dr. J. E. Sheppard continued the history of a case reported at the November meeting of the society. At the time of that report, November 22, 1910, the patient's blood showed the streptococcus capsulatus, and when examined yesterday this organism was still present in the blood. The man entered the hospital on November 2d, with a temperature of 103.8 degrees. He objected to operation and was kept under observation. When he came in the blood count showed thirteen thousand white cells, with seventy-four per cent polymorphonuclear leucocytes. The count ranged from six to eighteen thousand whites, with from sixty-four to eighty-four per cent polymorphonuclears, for the next three weeks. On November 4th and 7th Widal reaction was negative. On the latter date the streptococcus capsulatus was found in the blood. It was found also on the 14th, 18th, and 21st. On November 25th the report was negative, and the patient was allowed to go home. On the 29th he returned to the hospital complaining of pain, swelling, and interference with motion in the right elbow joint. This proved to be due to an abscess in which was found the streptococcus capsulatus. An abscess in the right side of the chest, which contained the same organism, was opened on January 9th. During the patient's second stay in the hospital blood cultures were taken on January 3d, 10th, 11th, and 14th, all of which were negative. A note in the history said that on January 18th the agglutination reaction was remarkably high, the patient's blood being particularly active in clumping the streptococcus capsulatus. The pathologist who studied the blood in this case thought the reason the presence of the germ in the blood of this patient was not as serious as it usually is was because of his power to manufacture within the body large amounts of bacteriolysins and cytolysins, which were able to take care of the germs. There were large numbers of the germs per cubic centimeter in the blood, but they were quickly reduced because of the active foe to the germs which the patient was able to beget in his blood.

DISCUSSION.

Dr. Gruening called attention to the fact that the infection may have originated from some other focus than the ear, which seemed to be the only focus present in the case. Perhaps the sinus should have been ligated. He considered these serious cases, and was inclined to question whether the end had been reached in this instance. According to the newest experimental researches, as published in *Schwartze's Archives,* the streptococcus precedes the sinus thrombosis. Some held that it is not necessary to operate, others that operation should be resorted to, but not necessarily ligation of the jugular nor operation upon the sinus. He thought operation indicated in the case cited by Dr. Sheppard, but whether it was necessary to ligate the jugular or to operate upon the sinus was a question.

Dr. Sheppard referred to what he had already reported concerning the case, dwelling upon the fact that the symptoms—bulging of the drum membrane, elevation of temperature, etc.—subsided, and that the patient was feeling so well that the speaker hesitated about operating, even though there were streptococci found in the blood. After the report of the sterile condition of the blood came in the patient left the hospital, and when later he returned with the abscesses on the elbow and chest wall, the blood culture was still negative. The only operation was incision of the drum membrane.

Dr. Gruening said the mastoid operation would have been performed on this case at Mount Sinai Hospital, and probably the jugular might have been tied. On the strength of the findings this would certainly have been the procedure.

Dr. Dench recalled a case operated upon at the New York Eye and Ear Infirmary long before blood cultures were known, in which streptococci were found in the vein wall. Infiltration of the vein wall occurred, as it undoubtedly does, before the thrombus had formed. The thrombus was secondary and often sterile.

NEW YORK OTOLOGICAL SOCIETY.

Stated Meeting, March 28, 1911.

JAMES F. MCKERNON, M. D., IN THE CHAIR.

Acute Suppurative Labyrinthitis in Conjunction With Acute Otitis Media Suppurativa.

DR. ARTHUR B. DUEL presented a young girl who had never had ear disease previous to November 3, 1910. At that time there developed acute otitis media following an attack of grippe. The right side was involved, the pain was severe, and the temperature high. Within twenty-four hours after the onset the drum membrane on the affected side underwent spontaneous perforation, and a profuse discharge followed. The speaker saw her first on November 7th. In the meantime she had been having irrigations of the ear, and the family physician had given her a purgative medicine which acted rather severely. During one of her visits to the toilet she fainted, this being the only instance of dizziness. The patient was sent immediately to the hospital for operation upon the mastoid. The mastoid was found to be filled with pus and serosanguinous fluid. On the second day after the operation acute otitis media of the left side developed. There was no nausea, no vomiting, and repeated examinations failed to elicit evidence of nystagmus. The high temperature which followed for three or four days after the mastoid operation was attributed to the acute otitis media of the other side. She continued to have a profuse discharge from the second acute ear, but this was not operated upon. Upon finding, after eight or nine weeks, that she had very poor hearing on the side of the mastoid operation, a functional test was made, whereupon it was discovered that she had completely lost the hearing on that side. The caloric test was negative, showing that she had no function in the vestibular apparatus of that side. The left side was then operated upon, when the mastoid was found to be filled with pus and granulations. Healing was perfect on both sides and the middle ear suppuration subsided completely. Functional tests having shown the absence of the vestibular apparatus, the assumption was that she had gone through an acute suppurative labyrinthitis which destroyed the vestibular and cochlear apparatus without exhibiting the characteristic symptoms. The noise apparatus showed absolutely no hearing on the right side. Tuning-fork tests had been made. A 256 v. s. fork was referred by bone conduction to the left side from all positions.

DISCUSSION.

Dr. Gruening called attention to the possible similarity between retinitis and labyrinthitis in certain cases in which the destruction takes place by chemotactic reaction. It is almost impossible, in such cases, to know that the process is going on. It is only where the suppuration can be seen that it is possible to know. The loss of hearing might be due to something other than pururlent labyrinthitis; it might be the result of destruction of the terminal apparatus by high pressure.

Dr. Duel added that, although the suppurative labyrinthitis had existed only since November, more than a month ago he had made the whirling test, which he had since repeated several times, without being able to notice any difference in the time of the after-nystagmus from the functionating horizontal semicircular canal, whirling in either direction. This suggested Dr. Dench's case shown at the last meeting in which a similar compensatory action following a destructive operation of labyrinth had in his (Dr. Dench's) opinion been wrongly attributed to a return of function of the vestibular apparatus of the operated side. In this case the function on the right side of the labyrinth has been destroyed by disease, yet the patient is compensated for this so perfectly that she now responds to the whirling test by an after-nystagmus equal in either direction. He had had two other cases in which the labyrinth had been destroyed and in which the whirling test showed the same compensation. Instead of accounting for this by saying that the vestibular action has returned on the side operated upon, it would seem much more rational to say that compensation has been so exact that one side now does the work of both.

Dr. Gruening, in connection with the case under discussion, cited the case of a young man who was absolutely deaf on one side and who had acute suppurative otitis media on the other side. A physician made a paracentesis, after which the patient became absolutely deaf on that side. The speaker saw him first after he became totally deaf, having been called in on account of mastoiditis. The mastoid operation was performed, and the patient made a perfect recovery from the operation; but he never recovered the hearing. The young man finally went to Vienna, where he saw all the great men. It could not be said that the paracentesis caused the deafness, or that purulent labyrinthitis was induced by the opening of the round window. There are other conditions which induce absolute deafness with which no one is yet acquainted.

Dr. Duel, answering a question by Dr. Harris as to how long after the first mastoid operation the deafness was discovered, said the discovery was made during the course of convalescence from the first operation, probably three or four weeks afterward. The patient could recall no vertigo, no nausea, no vomiting, or anything else of significance, except the fainting on the occasion cited.

Answering a question by Dr. McKernon, as to what the hearing was in the right ear at the time of operation, the speaker said no careful functional test was made at that time. The whisper test was made, and it was found that she could hear the whisper, so that evidently the hearing had not then been lost. Careful inquiry failed to elicit a history of any previous trouble with the ears, and so far as the patient knew her hearing had been perfect.

Recurring Bleeding From the Ear.

Dr. J. E. Sheppard related the history of a young woman, eighteen years of age, in good health, who two years ago had recurring bleeding in small quantities from the left ear, lasting for a month or two. Ever since this first appeared she has been partially deaf and has had some pain at intervals. At times a throbbing in the ear, not connected with the pain, and tinnitus like the dropping of water. The eustachian tube was free, and the tympanic cavity dry. A hemorrhagic spot can be seen in the tympanic membrane, which the speaker thought to be purpuric. He presented the patient for the purpose of showing the color of the membrane.

DISCUSSION.

Dr. Alderton was reminded by this case of one which had been sent to him two or three weeks before, in which there was a little growth at the umbo about the size of the head of a pin. It was slightly raised from the drum membrane and was very red. The remainder of the drum seemed to be normal. The tympanic cavity and tube, upon inflation, were found to be clear. The diagnosis of angioma was made, and the patient was advised to report from time to time for observation. This patient was a woman forty-four or forty-five years old, who had just finished the climacteric. He had been wondering, since seeing Dr. Sheppard's case, if the conditions are not the same.

Dr. Gruening said the condition might be due to a deposit of the coloring matter of the blood in the interstitial layers of the drum membrane. The same condition might be found in the cornea.

Dr. Dench suggested that the injection might have touched the otic ganglion.

Dr. Sheppard, in closing the discussion, said the drum membrane had presented this appearance for at least two years, according to the history of the case. Upon inflation there is no change whatever in the color of the drum. He had thought vaguely of an explanation such as Dr. Whiting had offered, but had not shaped it in this definite way.

Dr. E. B. Dench reported a case of

Persistent Tinnitus Treated by Means of Division of the Auditory Nerve Trunk.

The patient came under his observation at the New York Eye and Ear Infirmary three weeks ago, giving a history of tinnitus of the right ear of so persistent and severe a character that he threatened suicide if not relieved. He was neurasthenic. There was some specfic involvement, the Noguchi test proving positive. The drum membrane on the right side showed the changes of moderate nonsuppurative inflammation. The tinnitus, which had persisted for several months, was so severe that division of the auditory nerve trunk seemed the only method of relief. The dangers of the operation and the possibilities of facial paralysis were explained to the patient, and he decided to take the chances. The operation was accordingly performed in two stages, the first part three weeks ago, and the second one week later.

The operation may be briefly described as follows: The patient was shaved from three inches below the nape of the neck to a point about two inches beyond the parietooccipital suture. The entire posterior aspect of the neck and the shaved area of the head was thoroughly sterilized and covered with a sterile dressing before the patient was put upon the table.

The patient was placed prone upon the face, the shoulders being well elevated and the head being supported at the forehead in a proper headrest. In this way, the neck was flexed as strongly as possible, rendering the tissues in the posterior cervical region tense. The anesthetic was administered with two catheters introduced through the anterior nares, these catheters being connected with a long tube so that the anesthetist was removed at a considerable distance from the patient, and was thus entirely out of the way of the operator and his assistants. The incision was made from just below the prominence of the second cervical vertebra, upward and a little to the left of the median line to a point just above the external occipital protuberance. The incision was then carried horizontally outward to a point just above the level of the line of auricular attachment, and was then carried vertically downward along the posterior border of the mastoid process to a point just below the tip of the mastoid. The first incision divided simply the skin and the superficial fascia. Pressure on the margins of the wound by the hands of the operator and his assistants, controlled the hemorrhage until the bleeding points could be grasped with clamps. The superficial flap was rapidly reflected downward throughout its entire extent. The incision was then deepened on every side, and the musculoperiosteal flap was reflected in the same manner. Hemorrhage was fairly free but was easily controlled. The mastoid emissary vein was divided as it emerged from the mastoid foramen. The hemorrhage was quickly and completely checked by plugging the mastoid foramen with a bit of sterile wood. The cerebellar dura was then exposed, by means of the gouge, at a point just below the inferior curved line, where the bone is extremely thin. This opening was rapidly enlarged by means of the rongeur forceps, care being taken to separate the dura from the overlying bone by the introduction, first, of a blunt director, and later, as the opening was increased in size, by means of the finger, so as to avoid any injury of the dura. In this way the cerebellar dura was exposed from a point just beyond the left of the median line upward to a point just above the lateral sinus, outward along a line corresponding to the sigmoid sinus, and downward to a line just above the foramen magnum. It did not seem necessary to open into the foramen magnum in this case, although no harm results from this procedure. The cerebellar dura was thus exposed over an area bounded on the left by the occipital sinuses, above by the lateral sinus, on the left by the sigmoid sinus, and below by a thin margin of bone just above the foramen magnum. The field of operation was irrigated quite frequently with a warm saline solution, in order that the normal temperature of the brain might be preserved. All hemorrhage was carefully controlled and the musculoperiosteal flap was then replaced and held in position by interrupted catgut sutures. The cutaneous flap was next replaced and held in position by interrupted sutures of silkworm gut. This constituted the first step of the operation. The patient was then returned to bed. Aside from the slight rise in temperature alluded to, the patient exhibited no untoward symptoms. He was given urotropin in doses of 45 grains daily for the next week, and one week after the primary operation, the second step of the operation was performed, as follows: The cutaneous and musculoperiosteal flaps were again reflected downward, and a dural flap was turned downward. In the formation of this dural flap the dura was incised just internal to the occipital sinuses, vertically upward to a point just below the lateral sinus, then horizontally outward along the line of the lateral sinus, and then downward just internal to the sigmoid sinus. The dural vessels could be easily seen and were surrounded by ligatures of fine silk prior to their division. On reflecting the dural flap the cerebellar hemisphere presented. It was retracted upward, inward and outward by means of a thin metal retractor, care being taken not to wound any of the blood vessels which traversed the surface of the cerebellum. It was necessary to manipulate the parts with the utmost gentleness, as a rupture of any of the cerebellar vessels would have caused sufficient hemorrhage to interfere seriously with the completion of the operation. On retracting the cerebellum a large amount of cerebrospinal fluid escaped. The cerebrospinal fluid and the slight hemorrhage somewhat obscured the field of operation, but the cautious use of gauze sponges effected the removal of this fluid. The slight venous oozing which occurred was then controlled by the use of sponges saturated in a 1/1000 solution of adrenalin chlorid. The use of the adrenalin chlorid caused a cessation of all hemorrhage, and was also of value, I think, in raising the blood pressure, as the patient suffered no diminution of blood pressure throughout the entire operation. Throughout the operation the field of operation was frequently irrigated with a warm normal saline solution, in order to maintain the brain substance at as nearly a normal temperature as posible. By cautious manipulation in this manner the nerves at the base of the skull were finally freely exposed. The auditory nerve, with the facial nerve accompanying it, was easily recognized entering the internal auditory meatus. The facial nerve was then stimulated by means of the faradic current, a sterile electrode being introduced into the cranial cavity and applied directly to the facial trunk, the opposite pole of the battery being applied to a neutral point. The auditory nerve was then severed by introducing a grooved director between the auditory and the facial nerves and pulling the director downward and outward. The central end of the auditory nerve was then pulled out from its central attachment by means of forceps. The cerebellar fossa was again irrigated with normal saline solution and the cerebellum allowed to drop back into place. The dural flap was replaced and held in position by fine silk sutures. The musculoperiosteal flap was next replaced and held in position by catgut sutures. The cutaneous flap was then brought into place and held in position by interrupted sutures of silkworm gut. After the second step of the operation, the patient made an uneventful recovery.

The operation had been performed about ten times in the history of medicine. Ballance, of London, had one case, in which there were some cerebral symptoms, and in which facial paralysis was already present. In the speaker's case there were no cerebral symptoms and no facial paralysis. The operation seemed justifiable in the presence of such severe and persistent tinnitus.

DISCUSSION.

Dr. Sheppard cited in this connection a case which had been in the care of Dr. Harvey Cushing, of Baltimore. Last August the patient, a woman, had been given an injection of alcohol for neuralgia in the lower jaw. Immediately following the injection she vomited continuously for thirty-six hours or more, having to remain in the doctor's office where the operation was performed for five or six hours before it subsided sufficiently for her to return home. Immediately after the subsidence of the vomiting she began to complain of tinnitus. The speaker saw her in October, at which time she complained of more or less deafness and of severe tinnitus. Examination revealed a small perforation in the anterior inferior quadrant of the drum membrane. During the next six weeks the drum membrane simply melted away without any evidence of inflammation. The patient then went down to see Dr. Cushing, who said he believed the auditory nerve would have to be destroyed in order to relieve the tinnitus. What destroyed the drum membrane the speaker did not know. Even if some of the alcohol at the time of the injection had gone into the eustachian tube, he could not understand why it should cause the melting away of the drum membrane. The condition might be the result of some disturbance of the trophic nerves. There was no history of tuberculosis. The neuralgia for which the injection had been made involved the inferior branch of the trifacial.

Dr. Dench, in closing the discussion, said the tinnitus had absolutely subsided since the operation. Answering a question by Dr. Harris, as to whether Richard Lake had employed the same technic in his cases, all of which were unsuccessful, the speaker expressed his impression that Lake operated first upon the labyrinth. Bryant had looked up the literature of the subject, reporting, as he recalled it, nine or ten cases. Most of these cases died. Ballance's case had a number of untoward symptoms after the operation. In his own case there were very few symptoms. After the first operation the temperature rose to 102 degrees on the first day but fell at once. Eight days after the primary operation, when the wound was reopened to complete the procedure, there was absolutely no pus. In Ballance's case there was semiconsciousness for several days and some tinnitus. In his own case there was some nystagmus for over a week. It was characteristic, toward the left side, indicating that the diseased labyrinth was out of commission. There was so much disturbance of equilibrium prior to operation that the patient walked with a cane, which he had now abandoned.

DR. E. B. DENCH asked if the members had had any experience with

Antistreptococcic Serum in the Treatment of Meningitis.

He employed it, but with no satisfactory results. In all the cases in which he used it the decompression operation had been done. The serum had been obtained from the Board of Health, and their instructions had been followed. He introduced 150 cc. into the vein, and as much into the cord as cerebrospinal fluid drawn out, this being usually 25 cc.

DISCUSSION.

DR. SHEPPARD had injected 10 cc. of the antistreptococcic serum directly into the cranial cavity in one case in which meningitis followed operation upon the mastoid and lateral sinus. Streptococci were found in large quantities in the cerebrospinal fluid. No drainage was used for six or eight hours, then a drain was put in. Forty-eight hours after the first injection another of twenty cc. was made. The patient died, but it seemed as if life had been prolonged. The first serum used was from the Lederle laboratories, the second from Parke, Davis & Company laboratories. The directions called for a small amount.

DR. LUTZ cited a case, previously reported, in which he gave twenty injections of 10 cc. of Parke, Davis & Company's preparation. Two injections were given a day for ten days. The patient recovered. Streptococci were found in the blood. He had used it in four other cases, all of which died.

DR. SHEPPARD added that he was giving the serum under the direction of a pathologist, who said it was the same as the Flexner serum, and that it would be better to put it into the subdural space.

Dr. H. A. Alderton presented a photograph of

Alveolar Sarcoma

in a child two years old. It followed an attack of what was supposed to be mumps and it proved fatal. A swelling appeared in front of the auricle and two glands become enlarged, one in front and the other behind the auricle. There was some granulation in the canal. He saw the case in consultation with Dr. Fisher, of Bay Ridge, who thought it was suppuration of the lymph glands and advised their removal. This was done, but no pus was found in the glands. The patient was then taken to the hospital for the mastoid operation. The child lived two weeks afterward, and examination showed the disease to be pronounced alveolar sarcoma.

DISCUSSION.

Dr. Dench called attention to the treatment of such cases by means of the "starvation method"—ligating the external carotid artery and its branches. In one case in which he had employed this method the patient made a perfect recovery. This was a case of very malignant melanosarcoma of the external ear.

Dr. Lutz recalled a case, reported twelve years ago, of small spindlecelled sarcoma in a boy twelve years of age. The patient died.

Dr. Richards recalled a case, presumably of sarcoma of the middle ear, upon which he had operated five months ago. The extensiveness of the disease, with very slight outward manifestations, was striking. There was total destruction of the tympanum and labyrinth, and the growth was attached to the cerebellar dura. There was a continuous flow of blood, such as would come from the lateral sinus. The patient left the table with a very good pulse, but he died two days later. The extensive bleeding was from the sluiceways in the bone.

Dr. Emil Gruening said he was asked recently to discuss a paper read before the Obstetrical Society on the subject of

The Advisability of Performing Abortion in Cases of Progressive Deafness.

The reader of the paper stated that many young women hear badly, and when they become pregnant the hearing deteriorates very much. He had been approached in one such case, and had promptly delivered the child, feeling perfectly justifiable in doing so. When asked to discuss the paper, Dr. Gruening did not know that abortion had actually been performed in cases of progressive deafness, nor did he know that it had been discussed in otologic literature. Upon looking up the subject he found that very little had been said concerning it. Schwartze, Politzer, Urbantschitsch, and others say very little. All of these authors quote the cases of Dr. Bean. He found that the author quoted had written an article in the *Buffalo Medical Journal,* in 1888, in which he mentioned a woman who in her eighth pregnancy became quite deaf. She had two daughters who had evidently inherited otosclerosis. The subject was discussed at the meeting of the Obstetrical Society from the medical point of view and not from the moral. The conclusion was reached that the operation was not justifiable. A woman, who has otosclerosis, will become deaf, whether she give birth to a child or not. It was asked whether it would be justifiable to sterilize a woman in such case so that she might perform her connubial function without giving birth to children. The speaker thought the question not a debatable one, and he did not debate it. He was surprised to hear the subject discussed. The analogy was suggested between performing abortion to prevent deafness and to prevent blindness. This was a mistake. In the latter case the patient's life is in danger. The abortion is not produced in order to prevent blindness, but to save the patient's life when she is about to die from nephritis. In ear disease the function of the ear is not saved by the abortion, the patient's life is not in danger, and the life of the child need not be sacrificed. He did not know whether the matter had been brought to the attention of other otologists, but to him it was quite new.

DISCUSSION.

Dr. Dench recalled a case in which a woman who had had five children became more and more deaf after the last two pregnancies. He thought it would have been perfectly absurd to produce abortion in order to prevent the progress of the deafness in the mother. To endeavor to prevent it in the child would be another matter, but even here it should be remembered that a generation is often skipped in the inheritance of any condition.

DR. DUEL thought if there is any question raised in this connection it should be as to whether otosclerotic persons should be allowed to marry at all. Some German otologists think such persons should be forbidden by law to marry. If such a woman is allowed to marry, there would seem to be no moral or legal right to produce abortion, in case she became pregnant.

DR. ALDERTON thought the stand taken by Dr. Gruening the correct one, at the same time there was no doubt about these cases growing worse.

NEW YORK OTOLOGICAL SOCIETY.

Stated Meeting, May 23, 1911.

JAMES F. MCKERNON, M. D., IN THE CHAIR.

Hemorrhage Into the Labyrinth.

DR. WENDELL C. PHILLIPS reported the case of a young woman, twenty-two years of age, rather under-sized, who, about two months previously, had contracted a severe cold. After considerable physical strain incident to her profession of teaching fancy dancing, she was suddenly seized with tinnitus, followed by nausea, vomiting, headache, and pain in the right ear. The symptoms were sufficiently severe to keep her in bed during the next day. She then became conscious of deafness in the right ear. She had several of these attacks, which completely unfitted her for any kind of labor. She was under the care of a neurologist for a time, when the speaker was called in consultation. When first seen the patient presented all the symptoms of labyrinthine disease, and the diagnosis of hemorrhage into the labyrinth was made. There was no history of specific or constitutional disease.

DR. ROBERT LEWIS reported the case of a boy 3½ years old who had had an

Acute Coryza Followed by Deafness.

He saw the patient ten days after the onset of the deafness.

The patient had no elevation of temperature, no pain was present, there was no bulging or redness of the drum membranes. The deafness was pronounced, and both ears were involved. The drum membranes, except for a slight yellowish hue, were normal in appearance; the light cone was present in each drum membrane; the yellow tinge seemed to be due to something in the tympanic cavity shining through the tympanic membrane and which was thought to be pus. Upon incision of both membranes a considerable amount of pus exuded from both middle ear cavities. There was a marked hypertrophy of both the pharyngeal and faucial tonsils and they were excised. The patient made a quick and complete recovery.

DISCUSSION.

Dr. **Dench** asked if the discharge from the ear had ceased, to which Dr. Lewis replied that it had not. He had operated only recently, curetting the cavity.

Dr. **Gruening** recalled a patient whom he had seen two years ago at St. Vincent's Hospital. The man had otitis media of several months' duration, for which he had been under treatment by a specialist for some time. The speaker advised the mastoid operation. Dr. Lewis, however, only removed a part of the drumhead, the patient meanwhile drinking some of the water of Lourdes. He recovered. The patient attributed his recovery to the water of Lourdes.

Dr. Gruening said it is not uncommon in young children to find otitis media purulenta which presents none of the usual symptoms. He had seen it in young patients who did not seem to suffer and in whom the usual symptoms of the condition are lacking. In such cases the drum membrane usually presents a gray appearance, but the landmarks are lost. Incision frequently reveals pus. He called attention to the fact that there might be pus without the presence of microorganisms. This is sometimes found in the anterior chamber of the eye, and perhaps also in the tympanic cavity. It would have been interesting to know the character of the pus in the case reported.

Dr. **Dench** thought the persistence of discharge for six years indicated radical operation, inasmuch as there was apt to be sufficient destruction in the tympanic cavity to preclude the possibility of relief by exploration of the cavity. The tendency was to delay radical operation too long. Several years ago he had advocated ossiculectomy, several of his cases having done very well under this treatment, but now, with improved technic, with primary skin grafting, and with the good results in hearing he preferred the radical operation. In a case such as that which Dr. Lewis had reported he would hardly hope for improvement by any other procedure than radical operation.

Dr. Dench recalled a case similar to that reported by Dr. Lewis, except that there was tenderness in the neck. Both drum membranes were incised. A probe passed into the tympanic cavity revealed the presence of the streptococcus capsulatus. Both mastoids were extensively involved.

Dr. Dench thought the chief fault at the present time is the attachment of too much importance to the radical mastoid operation. He did not consider it as dangerous as the extraction of the ossicles through the external auditory meatus. He had obtained as good results by this means as by ossiculectomy. Of course there is danger of facial paralysis following the radical operation, but he had had as many cases of facial paralysis following ossiculectomy as following the radical mastoid operation. He considered the radical operation a great deal safer in chronic suppuration than the socalled simpler procedure. This was contrary to what was taught fifteen years ago. As a general procedure the radical operation was indicated, and in a case which had persisted for six years it certainly was the method of choice.

Dr Lewis, in closing the discussion, said the drum membranes looked so nearly normal that he hesitated about incising them. The discharge continued a week after incision.

Malleus Lying Free in the Tympanic Cavity.

Dr. Robert Lewis reported a rather unique case. The patient, a boy, had had a slight but malodorous discharge from both ears for about six years. On the right side there was a pinhole perforation in the center of the drum membrane. The lower half of the membrane was removed for the purpose of examining the middle ear to determine the cause of the discharge.

On examination of the tympanic cavity with a probe a hard substance was found on the floor of the cavity. This was removed by means of a forceps and was found to be the malleus, intact and without even an erosion on its surface at any point; it was lying free across the floor of the middle ear.

Upon removal of the entire drum membrane it was found that the incus was missing. The presumption that the patient had had an acute purulent otitis media some years before, that this had become chronic, and that the incus had sloughed away, the malleus falling down into the cavity, and the drum membrane reforming except for the small perforation. There were some granulations present.

DISCUSSION.

Dr. Phillips did not consider it an unusual thing to find a wholly or partially dislodged malleus in the tympanic cavity. In his experience such findings were in tuberculous patients.

Dr. Kenefick asked if the patient had had scarlet fever. He had seen two cases in eight years in which the malleus had fallen into the canal, in each case following scarlet fever and acute middle ear suppuration.

Dr. Dench had not seen many such cases. Where there is sufficient caries to destroy the malleus and make it assume the role of a foreign body in the tympanic cavity, it is only logical to assume that there is extensive suppuration in the tympanic vault. The blood supply of the malleus is good, whereas that of the incus is poor; it would therefore be less remarkable for the latter ossicle to become detached.

Dr. Lewis, in closing the discussion, agreed with Dr. Dench that it would be advisable to resort to the radical mastoid operation in such a case if there were present a carious condition of the ossicles. He did not consider this condition present in the case under discussion. The history of the case was obscure. The patient had had measles, but he was not sure about scarlet fever. He could not see how the malleus could have fallen down unless the tympanum had sloughed away and then reformed with the exception of the small perforation.

Dr. J. A. Kenefick referred to a paper which had recently been presented before the Otological Section of the Academy of Medicine which dealt with the

Relation of Dental Lesions to Aural Affections.

The author of the paper cited a case of persistent pain in the mastoid region, in which operation was resorted to, and in which radiographs revealed the cause of the trouble as nonerupted teeth improperly placed. Other radiographs were presented which were quite instructive from the aurist's point of view.

DISCUSSION.

Dr. Dench thought there was a tendency to confuse dental otalgia with an inflammatory condition of the geniculate ganglion. It was possible to have herpes zoster without any eruption at all. In all cases of obscure pain in the mastoid the aurist should bear in mind possible dental lesions. In the absence of any dental lesion, such as unerupted or misplaced teeth, these cases of otalgia fall under the head of herpes without eruption, or of primary neuritis of the auditory or facial nerves, or of the geniculate ganglion. The only remedy was to sever the nerve instead of extirpating the ganglion.

Dr. Gruening thought separation of the nerve, as suggested by Dr. Dench, should be the very last consideration. Sometimes pain in the nose or throat radiates to the ear. Cocainization of the nose or throat will often relieve the pain; if not, the patient should be sent to the dentist.

Dr. Lutz had had two cases during the winter of dental otalgia, which were suggested by Dr. Kenefick's allusion to the relation of dental lesions to aural affections. About Christmas a woman had consulted him for earache. She had had no toothache, and so far as he could see there was nothing the matter with her. In looking over her teeth he found one tooth which had been capped. When questioned about it she said it was sometimes sensitive to heat and cold. He sent her back to the dentist, who said there was nothing the matter with the tooth, and who maintained that the trouble must be in the ear. The speaker then had a radiogram of the tooth made, which revealed suppuration at the root. When this was attended to the pain ceased.

In another instance a young girl complained of earache, some of the pain being in front of the ear, but most of it inside the ear. She presented some of the symptoms of mastoiditis. The trouble was found to be dental otalgia, traceable to a capped tooth. Such cases are fairly common.

Dr. Duel was inclined to think that the otalgia in the cases cited by Dr. Dench should not have been attributed to the nerve until a more careful examination of the teeth had been made. He had had a case of severe double otalgia in which examination of the ear revealed nothing. The patient had had a good deal of crown and bridge work done, but, after a careful examination, the dentist reported that everything was in good condition in the mouth. Radiographs were then made. which showed that there were two misplaced wisdom teeth. These were removed and the pain ceased.

Dr. Kerrison, referring to the radiographs mentioned by Dr. Kenefick, said that a great many had shown abscesses at the roots of the teeth. Others showed only teeth abnormally placed, i. e., teeth growing laterally, or at right angles to the other teeth. The practical point for otologists is that in cases of obscure aural symptoms radiographs will often show dental lesions or abnormalities which are not revealed by the usual direct examination of the mouth either by aurist or dentist.

Dr. Sheppard said there are some cases in which the radiograph shows nothing, as where an exostosis presses upon the dental nerve.

Dr. Lutz said it is not difficult to trace otalgia in cases of acute tonsillitis or some other evident trouble, but in the instances which he cited the teeth were not thought of until other conditions had been carefully looked for. He had had a case of otalgia which was traceable to sphenoid disease. As soon as the sphenoid was clear out the otalgia subsided.

Dr. Kenefick suggested, in closing the discussion, that it would be a good idea to have the paper to which he had referred, with the exhibition of radiographs, repeated in the fall. The pictures showed the various conditions of the teeth which might give rise to otalgia. Dentists were inclined to think that when the nerve of a tooth is dead it can give no trouble. This is not necessarily true, for the preparation of the tooth may have been defective, particulaly if done some years ago.

Dr. James F. McKernon said the use of

Urotropin in the Treatment of Purulent Meningitis

was first brought to his attention by Dr. Cushing, of Baltimore. He suggested its introduction into the spinal canal. After withdrawing the cerebrospinal fluid he introduced fifty grains of urotropin in from 15 to 20 cc. of normal salt solution. There was a marked drop in the temperature within four hours after the injection. The streptococcus, he says, will not live in the presence of a concentrated solution of urotropin. The speaker had employed the method in three cases, which he had not reported because of insufficient data. The results, however, were sufficiently encouraging to make him believe that it is of distinct advantage in the treatment of purulent meningitis. Whether the improvement was coincident in these three cases, or due to the urotropin, he could not say. Each case presented the classical symptoms of purulent meningitis. In two there was complete coma until the urotropin was injected. Several hours after the injection consciousness returned. He had mentioned this in the discussion of Dr. Crockett's paper, two years ago, and suggested that the method should be tried, but he had made no formal report because he felt that the results should be verified by a large number of cases.

Dr. McKernon added that in the first two cases treated with urotropin he had used only 30 grains. While this dose had some effect upon the temperature it was not comparable to the effect of the large dose subsequently employed.

DISCUSSION.

Dr. Dench considered the introduction of urotropin in the treatment of meningitis a distinct advance. He had used the antistreptococcic serum without result. He had employed it in doses as high as 150 cc., by injection into the spinal cord and also intravenously, but with no favorable effect. In his experience patients with otitic cerebrospinal meningitis usually die.

Dr. Dench thought the cases very interesting. He had used urotropin internally in some cases, but had never injected it into the canal. He had also used it as a prophylactic measure in section of the auditory nerve. Cushing gives it internally in all brain operations.

ABSTRACTS FROM CURRENT LITERATURE.

I.—EAR.

Intracranial Murmurs in Their Relation to Tinnitus Aurium.

Hyslop, London (*Lancet,* October 14, 1911, p. 1062). In the Hunterian lecture for this year Prof. Hyslop discusses the above subject and shows on anatomic and physiologic grounds how some of the severest forms of tinnitus may have their origin within the cranium and independent of any direct disease of the auditory apparatus. Most of these murmurs have to do with movements of the brain itself and the abnormal conditions of the blood vessels. Many can be directly auscultated, and although present knowledge gives little hope of relief from the unbearable noises, it is hoped that a better understanding of the matter will lead to an ultimate solution of the trouble. It is a question which specialists should carefully study in order to be able to differentiate at once the incurable forms from those which fall directly in his specialty and capable of some amelioration. *Horn.*

Acute Middle Ear and Mastoid Inflammations. The Relations of Active Autointoxications.

Snow, London (*Lancet,* October 14, 1911), considers that much can be done in hastening the healing of mastoid inflammations by internal measures. "The whole question of local congestion revolves around and rests upon the state of glandular activities. If the antibodies, nature's army of opsonins, are in normal quantities and in normal activity they fight down and keep in subjection bacteria that are always ready somewhere in our economy for pernicious development." We should always be on the outlook for stored up toxins. The tonsils, the accessory sinuses, or the tympanic cavities may harbor staphylococci, streptococci or any other bacteria, opposed as he terms them by a few attenuated antibodies. His method of combating these invaders is principally by means of small divided doses of calomel, which he considers the greatest of alteratives. Since adopting this line of treatment his patients recover in one-half the time they formerly did and with one-third the effort. A method such as this certainly deserves trial, especially for those who have not used it as a routine treatment for years past. *Horn.*

Results in Treatment of Thirty Cases of Otitis Media by Vaccine Therapy.

C. L. McDonald (*Jour. Amer. Med. Asso.,* June 3, 1911) reports thirty cases of subacute and chronic otitis media treated with vaccine, with, in the main, good results.

In nine cases he found a short, actively motile bacillus, which grew readily on any media, and was negative to Gram's stain. The culture of this bacillus had a very foul odor, similar to the odor of the discharge from the ears. The cases in which this organism was present showed little or no improvement after a course of seven or eight inoculations. In cases in which the staphylococcus, streptococcus or pneumococcus were the causative organisms, either alone or combined, the patients were markedly improved or entirely cured. Cases in which the staphylococcus and bacillus pyocyaneus were present improved more slowly than those with the staphylococcus alone.

In conclusion, he felt safe in saying that in subacute otitis media, no other means of treatment is capable of producing such uniformly good results as vaccines. Their early use would greatly diminish the large number of chronic cases so common to every physician and so annoying to the individual. *Richards.*

Use of Fibrolysin in Fibrosis of the Middle Ear.

Macleod Yearsley (*Jour. Laryngology,* May, 1911). Thiosanin and its derivative, fibrolysin, appears to possess a peculiar property of softening cicatricial tissue, causing an edema in this tissue with swelling up and dissociation of the fibers and softening. This action does not occur in healthy tissue unless therapeutic doses are exceeded. It softens cicatricial tissue, but does not destroy it. Its effect is rapid, but of passing character, and it can only be an auxiliary to mechanical treatment. Although stated to be an inoffensive agent, it has been attended in a number of instances with untoward results.

Its use was proposed in 1897 in otology for cases of adhesive otitis, with varying results from different observers, vaunted by some, condemned by others. Yearsley gives careful clinical histories of twenty cases, seven males, thirteen females, in which he used the remedy with improvement. In three there was no improvement, in sixteen the results were doubtful. Seventeen cases had tinnitus, but only in two cases was it improved by treatment. The author has doubt even about the action of the fibrolysin in those cases which he reports improved.

He concludes that whatever may be its effect upon cicatricial tissue elsewhere, it has no action upon pathologic fibrosis in the middle ear. *Richards.*

Otosclerosis.

Gustave Bruhl (*Journal of Laryngology,* June, 1911) considers the best name for the lesion present in otosclerosis to be "spongy hyperostosis" in the oval window.

We come now to consider why it is that the bone in the neighborhood of the stapes is so liable to this transformation. Are there any conditions in this region which favor such a change?

In order to elucidate these problems he submitted his preparations to Prof. Gebhardt, the well-known authority upon transformations of bone. His opinion agreed with that of Bruhl, viz., that the changes in the bone which lead to the typical ankylosis of the stapes are the result of the action of forces of traction and compression. The neighborhood of the articulation of the stapes is a likely spot for the development of proliferation in the bone for the following reasons: Immediately in front of the oval window the tendon of the tensor tympani passes over the "arciform fasciculus" on its way to the malleus; secondly, the movement of the stapes is more extensive in the anterior than in the posterior pole of the oval window. The continual pulling of the tendon, together with the friction of the footplate of the stapes on the anterior border of the foramen ovale, produces an incessant movement of the periosteum and an irritation of the bone lying between the tendon and the angular ligament of the stapes. The cartilaginous covering of, and the cartilaginous residua in the bone at this place render it very liable to transformation. To sum up, the traction and friction induce hyperemia and a tendency to proliferative processes in the periosteum and in the bone.

As a rule, the formation of hyperostosis remains limited to the oval window, but in some varieties isolated areas of transformed bone may also be found elsewhere in the capsule of the labyrinth. In such cases the focus in the vicinity of the stapes is the oldest. We may, therefore, assume that the production of the diffused foci is set agoing by the initial deposit at the oval window. *Richards.*

Operation for Aural Vertigo.

RICHARD LAKE (*Lancet*, June 10, 1911). It is better from all points of view to restrict the term Meniere's disease to an apoplexy of the labyrinth due to leucemia and allied conditions of the blood. For this reason also it is better to consider the great majority of cases in which giddiness arises from disease of the internal ear as aural vertigo.

Lake has operated upon ten cases of aural vertigo since 1904, four cases of which have been previously reported. None of them were connected with suppurative processes. The operation is done in those cases which have none or only a slight degree of hearing, which the patient is ready to sacrifice, provided that relief is obtained from vertigo.

For details of the technic the reader is referred to the text books of otology.

The labyrinth should be opened both above and below the facial nerve. Injury to the facial nerve is not an uncommon complication. Unless the facial nerve itself has been injured, complete recovery will follow. Injury to the facial nerve, the author thinks, is due to faulty technic on the part of the operator. In the cases reported the relief justified the operation, and the author thinks that relief may be promised.

Relief may be promised with certainty in those cases of aural vertigo, which must otherwise render life a burden to the sufferer, by an operation which in itself has no risk to life. The slight risk of a temporary facial paralysis does not in reality require a passing thought; the hearing is the only important factor. It is not too much to say that where the cochlear division of the eighth nerve is relatively intact, no operation should be considered, unless one is able to demonstrate without a shadow of doubt that the vertigo is of purely aural origin. And this is a combination which in all probability does not exist. Vertigo of other than aural origin is usually accompanied by at least fairly good hearing. But whatever perception of sound the patient may have in the diseased ear will almost for a certainty be destroyed by the operation, and the question for the patient to consider is whether he will sacrifice the vestige of hearing which he still retains, in order to obtain relief from vertigo. But in those cases where the hearing of the diseased ear is lost, there can be no question whatever of the propriety of the operation or of its successful issue. And when vertigo or nystagmus, or nystagmus without vertigo, remains or is present for more than, at the outside, ten days after the operation, then we may assume that the operation has not been as complete as it should be, although the ultimate results will be quite satisfactory.

Richards.

Labyrinthitis.

URBANTSCHITCH (*Wiener medizinische Wochenschrift,* No. 41, 1911) states that from a prognostic, therapeutic and differential diagnostic standpoint, it is of the greatest importance to distinguish the serous forms of inflammation of the labyrinth from the purulent.

In the Vienna clinic a labyrinth operation is only permitted when the function of the cochlear and vestibular apparatus has been destroyed.

A case reported by Ruttin demonstrates the importance of this. Five days after a radical mastoid operation had been performed, labyrinth symptoms, fever, complete deafness, and a severe spontaneous nystagmus, developed. The function of the vestibular nystagmus, as shown by the caloric test, had not however completely disappeared. This one indication induced Ruttin to put off the labyrinth operation, and the subsequent history of the case proved that he was right, because while the deafness persisted, the vestibular reaction returned and remained normal.

The same author in another article mentions the importance, when a labyrinth suppuration has been diagnosed, of operating immediately, at the same time the radical mastoid operation is performed, and not waiting to see what the result of the mostoid operation is going to be. If this procedure is not followed, a rapidly developing meningitis may render the operation hopeless.

Circumscribed inflammations of the labyrinth do not per se indicate any special surgical interference. There are many cases in which the wall which separates the middle ear from the labyrinth has been partly destroyed by a labyrinth suppuration. In such cases, a labyrinth fistula exists, and many of these get well after the middle ear cavities are opened up. It is remarkable that a labyrinth fistula may go along without any symptoms.

Baràny describes a case of this kind, which in six weeks went on to a complete destruction of the labyrinth, without any labyrinth symptoms, such as dizziness and nystagmus, being present during the entire course of the disease.

It was formerly believed that when a suppuration of part of the labyrinth existed, the other parts of this organ must also be involved, but Herzog has lately been able to demonstrate that a true circumscribed, purulent labyrinthitis could exist. Purulent inflammations of the labyrinth occasionally get well spontaneously.

Marx has reported the histologic findings in a patient who had died of a croupus pneumonia, in whom a purulent labyrinthitis in the process of healing, was found. *Theisen.*

The Treatment of Suppurative Otitis Media by Bacterial Vaccines.

W. G. Weston and J. A. Kolmer (*Jour. Amer. Med. Asso.,* April 15, 1911) have treated, with bacterial vaccines, a large number of cases of suppurative otitis media following scarlet fever. Of 2,537 patients, 308 or 8.2 per cent, developed suppurative otitis media. One hundred cases extended over a period of nine months, and were treated with autogenous vaccine with good results, the period of the discharge being considerably diminished.

Staphylococcus aureus was found alone in 14 cases.

Staphylococcus albus was found alone in 2 cases.

Bacillus pseudodiphtheriæ was found alone in 35 cases.

Bacillus pyocyaneus was found alone in 20 cases.

Streptococcus pyogenes was found alone in 4 cases.

Staphylococcus aureus and B. pseudodiphtheriæ were found together in 9 cases.

Streptococcus pyogenes and B. pseudodiphtheriæ were found together in 4 cases.

Bacillus pyocyaneus and B. pseudodiphtheriæ were found together in 9 cases.

Streptococcus pyogenes and B. pyocyaneus were found together in 3 cases.

If no improvement was noted after the third dose of vaccine, or if ten days elapsed before vaccine could be administered to a case after culture had been taken, a reculture was made and a new vaccine prepared.

The initial dose for the average patient 10 years of age was about as follows:

Staphylococcus aureus and albus, 15 to 40 millions.

Bacillus pseudodiphtheriæ, 35 to 50 millions.

Streptococcus pyogenes, 5 to 10 millions.

Bacillus pyocyaneus, 50 to 80 millions.

It is well to give a small dose at first and note the extent of the reaction. This reaction will be a good guide for determining the size of the succeeding dose. Doses repeated every fiv to eight days.

Following the administration the majority of patients develop a temperature varying from 100 to 102 F. in about eight hours, gradually reaching normal in twenty-four to thirty-six hours. "We have seen the temperature fall a degree or so to subnormal after an injection, reaching normal at the end of twenty-four hours. A second dose should not produce so much fever, and when doses are properly selected the temperature reactions are quite conspicuous, each being lower than the preceding, as the patient's system is charged with an increasing quantity of opsonins, until finally no fever follows the administration. The local reaction is usually quite typical. If one has succeeded in securing the organisms producing the infection, its vaccine will produce an increased amount of discharge for twenty-four to thirty-six hours. This is of good prognostic value. The discharge may gradually diminish in amount or cease suddenly and entirely. The general improvement in health in many of the patients was indeed striking. In addition to the temperature and local reaction, the patient, if old enough to express himself, will sometimes complain of lassitude, sleepiness, slight headache, etc. We have been fortunate enough to escape abscess formation."

Under vaccine treatment 21.99 per cent of cases are cured in from one to thirty days, as compared with 7.46 per cent under usual treatment in the same period of time.

During this work the following are considered as contraindications to the administration of vaccines:

1. Cases of continued fever.
2. Acute nephritis.
3. The occurrence of other infections means cessation of vaccine treatment.

The Technic.—The ear is cleansed of the excess of secretion by means of probe and cotton, and then a culture is made in sterile bouillon by means of a sterile swab. This culture is then plated out by inoculating the water of condensation in successive large tubes of plain or gelatin-agar. This water is run once over the surface of the media. In twenty-four hours the colonies are well developed and usually well isolated. They are examined microscopically and subcultures made on large tubes or bottles of slanted agar. If the streptococcus was being cultured glucose-gelatin-agar was used. At the end of twenty-four hours the culture is examined microscopically for purity and morphologic characteristics of the organisms; subcultures are made on various media, and in case a diphtheria-like bacillus is present a toxin is prepared by growing for forty-eight hours in alkaline (0.5 per cent phenolphthalein) bouillon to which is added one per cent glucose. This is administered, unfiltered, subcutaneously into the abdominal wall of a 250-gm. guinea pig, the dose being 0.5 per cent of the body weight expressed in cubic centimeters. The cultures are washed off the surface of the medium with sterile normal salt solution, diluted with the same solution, and counted by comparing the number of bacteria with human blood as a standard. For staining these slides it is very essential that the stain employed produces no precipitate. We used, and can warmly endorse, the method consisting of fixation for five minutes in a saturated solution of bichlorid of mercury, followed by washing and immersion in a solution of carbolthionin for a few minutes. After counting, the emulsion is sealed in a drawn out test tube and heated in a water bath, fully immersed, for one hour at 58 to 60 C., never over 60. The tubes are then opened and cultures made on slanted agar. *Richards.*

II.—NOSE.

Relation of Nasal Obstruction to Articulatory Capacity in Children.

ERNEST JONES (*Brit. Jour. Children's Diseases*, June, 1911) has found that in average school children (469 cases, 106,500 tests) the articulatory capacity for consonants is found to vary with the degree of nasal obstruction. The dependence of the capacity on this factor is not very close, but is more decided with boys than with girls.

In children with gross articulatory defect or dyslalia (231 cases, 52,000 tests) no correlation whatever was found between the extent of this defect and the degree of nasal obstruction present. *Richards.*

Lupus in the Interior of the Nose.

S. A. PFANNENSTEIL (*Berl. klin. Woch.*, January 23, 1911). Lupus of the interior of the nose is treated by Strandberg of Copenhagen after the method of Pfannensteil, the theory of which is that the bacteria in tubercular tissue could be destroyed and the ulceration healed if it were possible to introduce a bactericidal body directly into the diseased tissue. To achieve this, sodium iodid is given by mouth, and peroxid of hydrogen is brought into contact with the tissue locally.

The patient is given daily three grams (45 grains) of iodid soda, divided into six doses. At the same time, the nose is filled with absorbent gauze, moistened with peroxid of hydrogen, a tampon being inserted every morning, and by means of a pipette the patient keeps it continually moist with peroxid of hydrogen. The tampon must be so applied as to be in absolute contact with all the diseased area.

Of thirteen cases so treated all but one showed good results, and in nine all symptoms disappeared. Duration of after-treatment given varies from five days to three months. *Richards.*

Scab Formation in Nose.

W. PEYRE PORCHER (*New York Medical Journal*, August 26, 1911) believes that coagulation of the nasal secretions, or scab formation, occurs as a result of the inflammatory secretions of the lateral sinuses coming in contact with respired air. This is assured, as evidenced by the fact that inflammatory secretions from a tracheotomy wound, or any other wound of the upper respiratory tract, coming in contact with the external air, will produce the same coagulation, or scab formation.

From this he infers that free outlet should be given to all pent-up secretions in the lateral sinuses, and that then such remedy should be administered as will maintain the fluidity of the nasal secretions as well as correct inflammatory conditions producing them.

He has found potassium iodid, in gradually increasing doses up to a large amount, to produce this result better than any other drug, and in the great majority of his cases the results have been permanent.

If results are not produced at first, the ethmoidal cells are cleaned out as much as possible, the iodid is pushed, with the result that the scabs usually cease forming, and the odor stops.

Richards.

Prophylactic Inoculation Against Hay Fever.

L. Noon (*Lancet,* June 10, 1911) at the laboratory of St. Mary's Hospital has been experimenting with prophylactic inoculations against hay fever. The condition of hay fever is considered as due to pollen toxin, and the theory of Dunbar is sustained. The results with Dunbar's pollartin are, however, only moderately good, cures being obtained only in exceptional cases. A pollen serum is prepared after the method of Dunbar, by extraction with distilled water, aided by freezing and thawing several times. The extracts were then sealed and boiled. Timothy grass was found to yield the most active extract. One gramme of this pollen was extracted with 50 cc. of water. One drop of a 5,000 fold dilution of this extract is sufficient to excite a distinct reaction in the conjunctiva of the more sensitive patients. The patient's resistance is measured by observing the strength of pollen extract necessary to excite a conjunctival reaction. Sensitive patients react to four units, while normal individuals fail to react with 2,000 units.

The unit is the quantity of pollen toxin which can be extracted from the thousandth part of a milligram of phleum (timothy pollen). The patients were immunized by subcutaneous injections of pollen extract. With minute doses the resistance of the patients rose rapidly, then as the dose increased the resistance ceased to rise, and even went back towards its original value. Ultimately a stage is reached at which the resistance ceases to rise.

The result of these experiments so far is to show that the sensibility of hay fever patients may be decreased, by properly directed dosage, at least a hundred fold, while excessive or too frequent inoculations only serve to increase the sensibility. It still remains to be seen whether the immunity thus attained is sufficient to carry the patients through a season without suffering from their annual attacks of hay fever. Patients are under observation who have undergone treatment for periods varying from a few weeks to eight months.

Richards.

Transplantation of Bone for Correction of Depressed Deformities of the Nose.

WM. W. CARTER (*Jour. Amer. Med. Asso.*, April 29, 1911). For cases in which a large part of the bone framework of the nose has been destroyed, Carter transplants a piece of rib properly shaped directly against the side of the defect, the soft parts in the periosteum overlying the bone being first separated so as to admit of its introduction. The piece of cartilage is taken from the middle of the ninth rib where the muscular covering is very thin. The patient is caused no inconvenience, and the resected portion is quickly reconstructed from the periosteum.

When the bone is split and the cancellous tissue removed the strips of compact bone can be easily shaped to suit the deformity, and, if the occasion demands it, several layers of this bone can be superimposed. It is necessary to remove the cancellous tissue, as this does not add to the vitality of the graft. In cases in which implantation has been made for defects in the long bones, and the medullary tissue has not been removed, it has caused an irritation and aseptic fever.

The detailed technic is as follows: The skin over the nose and over the ninth rib on the right side is prepared for an aseptic operation; a short transverse incision is made down to the bone at the nasofrontal suture. Through this incision the skin and subcutaneous tissue over the dorsum of the nose are elevated with a long, thin, two-edged knife, curved on the flat. Above this incision the tissues, including the periosteum, are elevated for about three-eighths of an inch. This wound is covered with sterile gauze. The ninth rib at about its middle is then exposed for two inches and shelled out of the periosteum and removed. "I then split this section of rib in its transverse diameter, scrape off its medullary portion and shape one of the strips of bone to suit the deformity. This is then inserted into the wound in the nose, previously made for its reception, care being taken to insert the upper end under the periosteum over the nasofrontal process. Both wounds are then irrigated with sterile salt solution, closed with silk sutures, and sterile dressings applied. The dressings are changed for the first time on the seventh day, and the sutures removed two days later." *Richards.*

A Contribution to the Question of Ozena.

J. S. Fraser and F. E. Reynolds (*Jour. Laryngology,* April, 1911) from a careful study of 138 cases of ozena, at the Royal Infirmary of Edinburgh, have reached the following conclusions as to its pathology and etiology:

1. No clear line of demarkation can be drawn between chronic purulent rhinitis and ozena. 2. Chronic purulent rhinitis (ozena) usually begins early in life as a hypertrophic catarrh of the nasal mucous membrane; the inferior turbinal is most severely affected, and has frequently gone on to atrophy while the middle turbinal is still in the hypertrophic stage. 3. The most common causes are the exanthemata, coryza in infants, and syphilis. 4. Chronic purulent rhinitis leads to various changes in the nasal mucosa, notably metaplasia of large areas of the superficial ciliated epithelium into squamous epithelium; dense, small celled infiltration of the submucous tissue (most marked in the superficial layers); catarrhal changes in, and atrophy of, the mucous glands; diminution in size and number of the cavernous blood spaces. In many cases there is atrophy of the turbinal bones, especially of the inferior turbinal. In some cases there is arterial disease, and in the majority of cases there is sclerosis of the deeper layers of the submucous tissue. These changes have their counterparts in the mucous membrane of the accessory sinuses in certain cases of chronic suppuration, in the middle ear cleft in certain cases of chronic suppurative otitis with cholesteatoma formation, and in the bronchi in such conditions as chronic puru-

lent bronchitis and bronchiectasis. 5. Various microorganisms give rise to the first stage of ozena, i. e., to acute and subacute purulent rhinitis, micrococcus catarrhalis, pneumococcus, staphylococci and streptococci, etc. The characteristic picture of ozena is probably only produced when the bacillus mucosus ozenæ is present. 6. Ozena is more likely to develop in a congenitally roomy nose than in a narrow one, on account of the greater tendency in the former to stagnation and consequent putrefaction of the secretions. 7. Atrophy of the nasal tissue may be due to the pressure of the crusts and to vascular or sclerotic changes, but is probably mainly due to toxic influences. 8. Tubercle and syphilis are concerned in the production of ozena, in that they may lead to chronic purulent rhinitis. 9. Accessory sinus suppuration is not the cause of ozena, though it not infrequently complicates this condition. 10. It is clearly established that ozena not infrequently occurs in several members of the same family, and there are some grounds for regarding it as a contagious disease. 11. Those who support the "primary bone disease" theory in regard to the causation of ozena have not shown that changes in the bone precede those in the mucous membrane; a lowered state of general health and neglect of treatment have probably more to do with the transition of purulent rhinitis into ozena than "congenital tissue weakness." No treatment is given. This is a study in etiology only. *Richards.*

Chronic Nasal Stenosis and Collapse Induration (Kroenig) of the Right Pulmonary Apex.

MAX ROSENBERG (*Fraenkel's Archiv. fuer Laryngologie,* Vol. 25, Part 1) reviews the literature of Kroenig's socalled collapse induration, and considers that it is dependent in the majority of cases upon chronic nasal stenosis or hypertrophy of the adenoid. The apices under normal conditions are almost atelectatic through their insufficient ventilation, especially before puberty. Chronic nasal stenosis brings about the entrance of irritating air into the lungs, giving rise to inflammation and occlusion of the smaller bronchial tubes. The natural result of this repeated inflammation is atelectasis from occlusion and fibrous induration. Such patients are also especially predisposed by anomaly of constitution to diseases of the respiratory mucous membrane. The apices are especially endangered, and all parts of the lungs, since in the first place their ventilation is deficient, so that they incline readily to formation of atelectases, and an especially large quantity of dust particles takes place, since they are deficient in the agencies which carry away dust from the other portions of the lungs. Futhermore they are so unfortunately situated that they receive partially the dust which is carried away from the lower lobes, and are not able to get rid of it. In cases of stenotic dyspnea the lower portion of the lungs draw down by force a portion of the alveolar air from the apices, which tends to increase the atelectasis.

The right apex is more frequently affected than the left, since much more dust reaches the right apex than the left. This predisposition is increased by differences in calibre, the course and points of departure of the bronchial tubes. In fifty cases of chronic nasal stenosis the author found eighteen cases of collapseinduration. The importance of collapse-induration to tuberculosis is very great, and the recognition of a possible predisposing factor in nasal stenosis should not be overlooked. *Goodale.*

Median Nasal Fistula.

H. Streit (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3). An 8-year-old boy exhibited a median fistula on the nose, originating from a tumor, which had been imperfectly extirpated. Histologic examination showed a lining of thick epidermis, containing numerous hairs, with sebaceous glands and sweat glands. The author considers the case one of dermoid cyst, transformed by operation into a fistula. Complete extirpation was done without recurrence.

Goodale.

Treatment of the Inflammatory Affections of the Accessory Sinuses.

Gustav Killian (*Deutsche medizinische Wochenschrift,* August 20, 1911) treats acute inflammations of the sinuses by inducing active hyperemia with an electric light bath. The apparatus, first constructed by Brunings, consists of a box which, with the patient in a recumbent position, is placed over his head. In the interior are four electric lamps, so set that their rays are directed against the patient's face. The eyes are protected by a heavy leather eye shade, and layers of gauze if needed. A glass tube is provided for breathing through the mouth the outside air. This air is moistened. The current is first turned on two lamps, then on four, the temperature rising up to 60, 70, 75, 80° C. The patient remains in the bath ten minutes. First, two lamps are turned out, then two more, and the temperature slowly goes down to room temperature. Treatment is given once or twice or three times daily. The pain is relieved, and Killian considers the results excellent. Sodium iodid to increase the secretion and aspirin for the pain are given at the same time. Complete healing occurs in one or two weeks.

Killian gives the technic of his radical operation as follows. It is to be employed only for chronic cases:

General anesthesia is always used, and careful incision is made in the eyebrow, and is carried on to the side of the root of the nose, along the frontal process of the upper jaw, down to the lower border of the nasal bone. The skin and periosteum above and below the incision over the orbit are separated. This separation is carried into the orbit as far as the tear canal, and to the paper plate of the orbit. The tear sac is separated from its attachment, the whole lower border of the frontal sinus laid bare as far as it is possible to do so. The resection of the anterior wall of the frontal sinus, the frontal process of the superior maxilla, the tear bone and, when necessary, a portion of the paper plate as well as the entire floor of the frontal sinus follows. Only the upper border of the orbit remains in the form of a bridge of bone. The mucous membrane is carefully removed from every crevice and furrow. The anterior middle and, when necessary, the posterior ethmoid cells are curetted with a sharp spoon so as to form them into a single, smooth-walled cavity, the mucous membrane of which has been removed, and which opens with a wide opening into the nose.

If the sphenoid sinus is diseased, its cavity is widely opened and curetted. The anterior portion of the middle turbinate is drained and cut off, as well as all the mucous membrane which covers the frontal process. The entire cavity is washed out with peroxid of hydrogen in the region of the ethmoid cells, and a piece of rubber sponge is laid which reaches to the choanæ of the nose. This tampon is removed on the next day. The skin is sutured on the third or fourth day. Only in the presence of simple mucous catarrh is primary suturing done. Often it is necessary to operate on the antrum and frontal sinus at the same time, in which case the antrum is operated upon first.

Several deaths have followed this operation on the frontal sinus. These cases have been due either to fatal complications which were already present before the operation, or they have been due to failures in technic.

The region of the olfactory fissure has not been sufficiently protected. This is very necessary, since the fibers of the olfactory nerve are accompanied with lymph vessels which are in direct connection with the subdural spaces. For this reason virulent pus can very easily infect the opened fissures, and in this case a purulent meningitis is likely to rapidly follow. Occasionally osteomyelitis of the skull bone is to be laid to the tearing of the primary suturing, and is easily avoided by the secondary suturing.

Careful attention must be given to the supraorbital nerve. If this is in the cicatrix neuralgia may be produced, which is only avoided by an additional resection of the nerve. The operation is not to be done if the patient suffers from ozena.

Richards.

Complicated Cases of Disease of the Accessory Sinuses.

W. Uffenorde (*Zeitschrift fuer Laryngologie,* Bd. III., S. 597, 1911) reports twelve cases of acute retrobulbar optic neuritis that all originated in conjunction with an acute inflammation of the accessory sinuses. Even if examination of the nose in such cases does not show anything very abnormal, the author believes that, particularly if the history of the case shows a previous rhinitis, a closer connection between the affection of the eye and nose must be thought of. The author bases his report on thirty-seven cases of affections of the accessory sinuses, coming under his observation in the Göttingen Clinic.

The disturbance of vision in his cases, the author believes, were caused by a stasis of vessels and a perineural edema of the optic nerve. The nasal treatment consisted in reduction of the middle turbinate, and the use of a powder of boric acid, menthol and cocain, which was snuffed up the nose.

The author reports cases of orbital phlegmons resulting from an acute or chronic suppuration in the frontal sinus or ethmoid cells.

Disease of the ethmoid cells causes more orbital complications than disease of the frontal sinus. The report of the case of a woman, aged thirtty-nine years, is given, in whom gradually a total paralysis of the right eye muscles developed without exophthalmos. During the operation necrotic masses were found in the posterior ethmoid cells and sphenoid sinus. Iodid of potash was given, but without result. After the operation the paralysis of the eye muscles gradually disappeared.

In three cases of suppuration in the antrum of Highmore with orbital complications, the author mentions the value of the Caldwell-Luc operation. Three cases of chronic suppuration of the ethmoid and frontal sinuses with cerebral complications, are also given. In one case a diagnosis of acute suppuration of the frontal sinus was made. The operation showed an absence of the frontal sinus, and the dura was immediately exposed. An extradural abscess resulted, which got well. This experience shows how important it is to have a radiograph made before the operation.

In another case, in a man twenty-three years old, an osteomyelitis of the frontal bone in connection with a chronic suppuration of the frontal sinus and ethmoid cells, led to a meningitis and septicemia. The Kuhnt radical operation was performed in this case, but the patient did not recover.

In the last case, a girl, nineteen years old, there was present an ozena with a left sided empyema of the frontal sinus and ethmoid cells. During the Killian operation an abscess of the frontal sinus with an extradural abscess was discovered. After two months of apparently complete cure, cerebral symptoms again developed and an abscess of the frontal lobe at a depth of 5 cm. was found. The patient died of a meningitis caused by a breaking through of the abscess into the ventricle. *Theisen.*

Chronic Infections of the Ethmoid Cells and the Sphenoid, with Especial Reference to Their Relations to General Medicine and Their Diagnosis Through the Roentgen Rays.

RHESE (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3) reaches the following conclusions in a paper of sixty pages:

1. Chronic inflammations of the ethmoid labyrinth and of the sphenoid are capable of maintaining a continuance of other nasal affections. They constitute, further, the point of departure for diseases of other organs of the body, near and remote, and have therefore a great significance for general medicine.

2. The significance is essentially increased by the fact that chronic infections of the ethmoid and sphenoid are in themselves exceedingly common diseases, and furthermore, since they readily maintain an insidious and latent course.

3. Chronic infections of these cavities are of importance for the etiology and the maintenance of the following diseases:

(a) In the nose they may give rise to chronic maxillary and frontal sinus suppurations and general polyposis, as well as the clinical picture of atrophic rhinitis.

(b) They give rise to injuries of the nervous system, not only organically through causing cranial complications of nasal origin and with great frequency a chronic ethmoiditis or sphenoiditis is hidden behind the external picture of an apparent neurosis and neuralgia. (Hysteroneurasthenia, migraine, supraorbital neuralgia and other forms of headache and attacks of dizziness.)

(c) In affections of the ear they share the affections of the accessory sinuses. Tinnitus is frequently observed in suppuration of the ethmoid. and the sphenoid is not rarely the expression of an acoustic neuritis occasioned by absorption of toxins.

(d) With reference to the numerous relations which exist to affections of the eyes, it should be remarked that affections of the anterior ethmoid cells are especially apt to occasion disturbances of the lacrimal ducts. Furthermore, involvement of the optic nerve apparently arises as commonly through diseases of the posterior ethmoids as through that of the sphenoids.

(e) The air passages may be involved over the nasopharynx and bronchial tubes. The cases of chronic bronchitis occasioned by latent suppurations of the ethmoid and sphenoid are especially important, since they give rise to suspicion of tuberculosis.

(f) Chronic gastric and intestinal diseases may be originated or maintained by chronic inflammations of these cavities.

(g) Among the diseases of a general nature, chronic anemia together with chronic influenza may be caused by these suppurations, as well as metastatic involvement of other organs, often of directly cerebral complications.

4. The Roentgen diagnosis of diseases of the ethmoid and of the sphenoid is best accomplished by the sagittal position and the oblique position. In the interpretation of the plate and photographs especial importance attaches to the obliteration of the boundary lines.

5. The sagittal position is, in the first place, adapted to show to us the degree and the extent of an ethmoid infection. The information which it gives us is most definite and certain with reference to the posterior ethmoid labyrinth. The sagittal position is less reliable than the oblique position with reference to the anterior ethmoid, and particularly with reference to the frontals. The first has, according to experience, frequently failed to establish in cases where the oblique position showed pathologic alterations in the anterior ethmoid territory.

6. The diagnosis of the sphenoidal infection through the sagittal position rests upon the presence of a shadow in a territory denoted by the diagrams. (Then follow details which require examination of the excellent pictures in the original.)

7. Oblique positions have the following advantages: (a) They permit a good view of the whole anatomic relations. (b) They give more definite information than the sagittal pictures with reference to the pathologic alterations in the anterior ethmoid territory, especially in circumscribed diseases of this, for the reason that the territory in question comes upon the plate in a broader and more comprehensive expression.

(c) This advantage is particularly marked in diseases of the frontal cells which by oblique position become uncovered by the opposite side and therefore completely isolated upon the plate. Where we wish to be especially certain as to the condition of the frontal cells, and their relations to the frontal sinus, the oblique position is frequently indispensable, since many cases are known to occur in which the origin of the pus and the clinical appearance is in favor of a frontal sinus suppuration, whereas actually the frontal sinus is poorly developed or entirely absent, and the suppuration actually arises from a large frontal cell.

8. For practical purposes in the majority of cases the sagittal position will be sufficient. If this is not adequate, the oblique position of both sides should be taken.

9. Chronic inflammation of the posterior ethmoid and of the sphenoidal sinus are found in about 66 2/3 per cent of all cases simultaneously. The value of the differential diagnosis between the diseases of these two regions is therefore diminished.

10. In many cases of latent disease the diagnosis may rest entirely upon the X-ray, as, for instance, when for the establishment of an ethmoidal or sphenoidal disease, the anatomic anomalies make extensive operation necessary for the establishment of the clinical diagnosis, and furthermore, when definite symptoms and complaints, such as, for instance, a sudden amaurosis, are found in harmony. This is particularly the case when dangerous complications, as orbital abscess, require an immediate clearing up of the situation and operation.

11. If the Roentgen rays show a definite obscuring while the clinical findings do not speak in favor of an ethmoidal or sphenoidal disease, further observations are necessary. As a matter of fact, many such cases consist of beginning alterations, which at the time are found neither on clinical examination nor by the complaint of the patient. *Goodale.*

III.—PHARYNX.

Retropharyngeal Struma.

TRAUTMANN (*Fraenkel's Archiv. fuer Laryngologie,* Vol. 25, Part 1) reports a case of a man 43 years of age, who showed a growth on the posterior pharyngeal wall, which had remained unchanged for four years, and is considered by him to consist of dislocated and isolated thyroid tissue, without connection with the true thyroid. No operation was done, and the author advised care in the operative treatment of similar cases, lest this may be the only existing thyroid tissue in the body, and its removal may be followed by myxedema.

Goodale.

IV.—LARYNX.

An Enlarged Demonstration Model of the Larynx.

KILLIAN (*Verhandlung des Verein Deutscher Laryngologen,* 1911, Curt Kabitzsch, Würzburg). It will interest teachers of medical students to know that Prof. Killian has had constructed a model of the larynx, enlarged nine times, the interior of which, by means of a mirror placed above it, can be demonstrated to students in all parts of a large lecture hall. The model is constructed by Herrn Vogelbacher, Freiburg, in Breisgau. *Horn.*

Laryngeal Paralyses in Diseases of the Medulla Oblongata and Semon's Law.

FREYSTADTL (*Fraenkel's Archiv. fuer Laryngologie,* Vol. 25, Part 1) reports two cases of syringomyelia which exhibited all phases of vocal cord paralysis according to Semon's law. These paralyses are undoubtedly of medullary origin. Posticus paralysis is most often encountered, and it would appear that in symmetrical, diffuse diseases of the medullary nucleus of the medulla, the nucleus of the posticus is more vulnerable, and loses its function most readily. *Goodale.*

Aphthous Ulcerations of the Trachea and Larynx in Tuberculosis of the Lungs.

S. ZIBA (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3) reports a series of cases characterized by small ulcerations in the larynx or in the trachea, not showing bacilli of tuberculosis histologically, but on the other hand numerous Grampositive streptococci. The author considers these "aphthous" ulcerations to be occasioned by streptococci which are contained in the sputum, and infect the surface of the mucous membrane, giving rise to superficial necrosis of the tissues. It is probable that these "aphthous" ulcerations often become themselves infected by tubercle bacilli. *Goodale.*

Gymnastic Exercises of the Vocal Cords by Means of Electric Tuning Forks.

E. N. MALJUTIN (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3) published in 1896 a method of exercising the vocal cords by placing the Bezold tuning fork on the chest or the head of the patient, who was then made to speak in unison with the tuning fork. The vibrations of the fork were transferred to the vocal cords and the patient found involuntarily the right tone. If the tuning fork was placed on the head, it was easy to obtain a socalled head voice; if it rested on the chest, the resonating chest imparted the timbre of the chest tones to the voice. The author has devised an apparatus by which the sound of a tuning fork is transferred electrically to a given portion of the body. The author has found this method of service in persons who have lost their voice from acute catarrhal inflammations and overstrain.

Goodale.

Isolated Fractures of the Trachea.

M. Zimmerman (*Archiv. fuer Laryngologie und Rhinologie*. Vol. 24, No. 3) reviews the literature, and considers the diagnosis as difficult to establish. In the larynx besides the subjective and objective manifestations of fracture, there may at times be found a deformity consisting of a flattening or widening of the Adam's apple, occasioned by the pressing in of the lateral plates of the thyroid cartilage, or an abnormal protrusion under the skin, in the form of irregular broken ends. At times one may also feel a slight depression at the point of fracture, or one may perceive an abnormal mobility of the individual cartilages of the larynx. Crepitation of the cartilage is rare, and is further to be considered with caution, since under normal conditions a form of crepitation may be elicited. An essential aid is the examination by the laryngeal mirror. At times lesions of the vocal cords may occur, or fragments of cartilage protruding into the lumen of the larynx, small hematomata, or swelling of the mucosa, which may extend the aryepiglottic folds, vocal bands and the covering of the arytenoids. The prognosis is usually good. If stenosis is present tracheotomy is necessary, but is to be avoided if possible. *Goodale.*

Contribution to the Diagnosis of Rheumatic Paralysis of the Recurrent Nerve, and the Value of the X-Ray Examination.

Levenstein (*Archiv. fuer Laryngologie,* Vol. 25, Part 1). A few cases have been reported of recurrent paralysis of probable rheumatic origin. Others have been reported, dependent upon chemical poisons and also from various infectious diseases such as influenza, diphtheria and typhoid. In some instances the recurrent paralysis may be complete, and if then gradually a typical posticus paralysis develops, tracheotomy may be necessary. The duration of the cases has ranged from 3 to 8 months, recovery being the rule. The author reports a case of a young man, previously in good health, who, after exposure to a draught, became suddenly hoarse, and showed on examination unilateral paralysis of the vocal cord, corresponding to the side of exposure. The treatment consisted partly in the use of the galvanic current applied both to the region of the right vagus and to the right vocal cord. After several months' treatment the motion in the cord returned, to a considerable extent, and the voice appeared somewhat better. The diagnosis of rheumatic paralysis would have been made, if later the X-ray examination had not been undertaken, This showed a spindle-shaped growth in the region of the subclavian artery, which was considered to be aneurysm of the subclavian.

Examination of the literature in the last twenty-five years shows that the greater number were reported previous to the discovery of the Roentgen rays, and in the great majority of the other cases no use was made of this method of diagnosis. The author consequently recommends great care in the making of a diagnosis of rheumatic paralysis. *Goodale.*

Two New Instruments for Bronchoscopic and Esophagoscopic Work.

KILLIAN (*Verhandlung des Verein Deutscher Laryngologen,* 1911, Curt Kabitzsch, Würzburg). For the purpose of conveniently examining the upper part of the esophagus and the hypopharynx, Prof. Killian has shown a long bivalve speculum which opens by hand pressure and fits into the regular Brunnings handle. He has also presented an instrument for measuring the diameters of the bronchial tubes on the living. This latter consists in a tiny pair of calipers on the end of the regular forceps handle which when opened in the bronchus registers the diameter at the handle. Both instruments are manufactured by F. L. Fischer, Freiburg. *Horn.*

The Combined Specific and Local Treatment of Laryngeal Tuberculosis.

EDMUND MEYER (*Verhandlung des Verein Deutscher Laryngologen,* 1911, A. Stuber's Verlag, Würzburg). At the meeting of the German Laryngological Society, held recently in Dresden, Meyer gives his results in 23 cases of laryngeal tuberculosis in which he combined the tuberculin treatment with intralaryngeal cutting operations. He used as his injection an emulsion of the tubercle bacilli, known to the trade as "Bazillen-Emulsion Höchst" nach Dr. Fritz Meyer (S. B. E. Höchst). In all his operations he used the bloody method and removed as much as possible at one sitting. He does not recommend the use of the cautery. From X-rays he has seen no cases cured. The method of using the preparation was exactly the same as for cases of pulmonary tuberculosis, and he insists on the giving of very small doses and never getting a reaction which would raise the temperature over 37.5 C. In those cases which formerly had shown but little tendency to be influenced by the tuberculin treatment, under this combined method he observed such results as had never before been his pleasure to see. Most of his patients were ambulatory, and some of his cures were certainly remarkable. The cases are not carefully tabulated, so that the reviewer cannot quote statistics. The case histories are well worth study in the original. *Horn.*

V.—MISCELLANEOUS.

The Action of Salvarsan on Syphilis of the Upper Air Passages, Scleroma, on the Plaut-Vincent Angina, and on Scorbutus.

GERBER (*Archiv. fuer Laryngologie und Rhinologie,* Vol. 24, No. 3) reports a series of cases of syphilis of the upper air passages, who had shown secondary tertiary lesions recurrent, in spite of repeated treatment with mercury and iodin. In all instances the specific lesions disappeared with great rapidity. The most obstinate one was a case of severe necrosis of the nose and upper jaw, in which a sequestrum required six weeks for exfoliation. Injections were made in the gluteus muscles in eight instances and in the veins in nine. The intravenous injection is least pleasant at the time, but soon becomes relatively more comfortable than those made into the muscles. Brief symptoms of poisoning occurred in some instances on the following day, but soon disappeared. Injections into the gluteus gave rise to infiltrations which were sensitive sometimes for two to three weeks.

The author tested salvarsan in one case of scleroma with negative result.

In the Plaut-Vincent angina, it yielded promptly, the discomfort disappearing on the next day, and the ulceration in three to four days. At the same time the spirochæte and fusiform bacilli disappeared. These results were in harmony with others already published by Ehrlich and by Rumpel. In one case there was an association of scorbutus characterized by ulcerative inflammation of the gums, mouth and tonsils, in which the inflammation disappeared on the second day.

These cases show that we have in salvarsan a specific remedy against spirochæte infections, in which syphilis naturally occupies the first place. *Goodale.*

The Correction of Facial Paralysis by Plastic Operations with the Muscles of the Face.

LEXNER, Jena (*Muench. med. Wochenschr.*, Vol. 58, No. 15), has succeeded in one case of complete facial paralysis in obtaining a very satisfactory cosmetic and functional result by transplanting the anterior edge of the masseter to the upper and lower angle of the mouth. In a similar way the anterior edge of the temporalis with its point was transplanted subcutaneously to the outer angle of the eye. The patient had a perfectly symmetrical position of the mouth even while laughing. *Horn.*

The Results of the Local Treatment of Chronic Inflammatory Diseases of the Bronchial Tubes.

EPHRAIM (*Deutsche medizinische Wochenschrift*, November 9, 1911). The former methods of treatment in chronic affections of the bronchial tubes fail in the majority of the cases. Inhalations of finely vaporized fluids are absolutely useless. Bronchoscopic examinations as well as animal experimentations show that even in the favorable cases the particles of the fluid used that reach the bronchial mucous membrane are so small in amount that the therapeutic action is practically nil.

The author has experimented on dogs and squirrels, by carrying an atomizer into the main bronchus and spraying in a coloring fluid and then immediately taking out the lungs, in order to prevent a diffusion of the fluid, and has found large parts of the lung colored. Microscopic examination showed, that in these regions, not only the walls of even the smallest bronchi, but also the walls of the alveoli were colored.

The author's investigations in animals show, that through these endobronchial injections, the fluid can be carried into the smallest bronchi.

Technic in Patients.—The fluid to be used in cases of bronchial catarrh, may be injected through a bronchoscope, but the author uses a method which is much more agreeable to the patient than the introduction of the bronchoscope. After anesthetizing the glottis by a spray or application and the trachea by using a properly curved vaporizer, a canula attached to a flexible vaporizer can be carried directly into the right or left bronchus. In order to inject the medicated fluid over as far an area as possible, the instrument is slowly raised and lowered while the injection is being made.

Therapeutic Results.—The author has treated one hundred and sixty-one patients endobronchially, that before had been treated without result in the usual way. Twenty-two were suffering from a chronic or subchronic catarrhal bronchitis. In eighteen of these cases after a single endobronchial injection, the improvement was so decided that further treatment for the complete relief was unnecessary. The injected fluid which is finely vaporized, was usually 5-7 ccm. for each bronchus. The author usually used novocain 2.0, suprarenin solution (1-1000) 10.0, physiologic salt solution ad. 100.0. In cases with very profuse secretion the author has used with good results a 1/6 per cent silver nitrate solution. In two cases of long standing purulent bronchitis with a few injections of a 5-10 per cent turpentine emulsion to which was added some suprarenin, the author was able to completely check the secretion.

In a case of bronchiectasis, after fifteen injections, the patient has improved so greatly that for a year he has raised only from 5 to 7 ccm. of an odorless sputum daily, while before the treatment he had been raising from 120 to 150 ccm. of a very foul secretion.

In a second case, the author obtained the same good results, the amount of expectoration diminishing from 250 to 60 ccm. The treatment in both these cases consisted in the injection of turpentine and other oils, iodoform, and iodol emulsion, preceded by the use of hydrogen peroxid.

The majority of the author's observations were in cases of bronchial asthma. He has treated one hundred and thirty-three asthmatic patients, endobronchially. The following interesting observations were made: The endobronchial injection of suprarenin mixed with novocain, invariably relieved the asthmatic paroxysms in a few minutes; patient's breathing became easy and the wheezing and whistling disappears.

The method, as to whether the injection is made through a bronchoscope or with the curved spray apparatus, does not make any difference. The complete relief from the asthmatic attacks in the majority of the patients lasts a long time, that is weeks, months or even over a year. In other cases, but much less frequent, the symptoms return after a shorter interval, but usually disappear again for a long time after one or more treatments.

Out of the one hundred and thirty-three asthmatics, there were thirteen in whom the asthmatic attacks only came on every few months and lasting only a few days. In this periodic form of asthma, the result of the treatment is not as good, but even in this form, out of ten patients who had been kept under observation, three remained entirely free from attacks. In six other cases of well marked neurasthenic asthma, in only two was a lasting result obtained.

The most favorable cases for treatment were the cases of true bronchial asthma, accompanied by chronic bronchitis and emphyema, with almost daily paroxysms. Of one hundred and three cases of this kind treated endobronchially, and in whom other methods of treatment had been absolutely of no avail, eighty-eight could be kept under observation. In seventy-two the result of the treatment was very satisfactory, and forty-eight of these did not have any recurrences.

Conclusions.—The author's experience with this method of treatment, shows without a doubt, that endobronchial injections furnish a method which is not only not harmful, but in many otherwise incurable cases, is of the greatest benefit.

The author states that the method must be more universally employed, before any positive conclusions can be drawn. It is a question as to whether diseases of the lung tissue itself cannot be treated in this way, because the author's experiments in animals shows that the injected fluid was carried even to the alveoli. *Theisen.*

BOOK REVIEWS.

Verhandlungen Vereins Deutscher Laryngologen, 1911.

Published by Curt Kabitzsch (A. Stuber's Verlag), Würzburg. Price, marks 7.0.

This year's meeting of the German Laryngological Society was one of the best attended and most important scientifically in the history of the society. In these pages many of the individual papers of the meeting have been and will be reviewed in detail, but every contribution this year is worthy of careful study. It is not fair to the rest of the excellent papers to select any for special notice, but certainly Prof. Rumpf's magnificent address on the present position of the tuberculosis question, and especially as it relates to the question of laryngeal tuberculosis, is well worthy of an especial translation in full.

Prof. Edmund Meyer gave a very interesting review of his work on the combined surgical and tuberculin treatment of laryngeal tuberculosis, an abstract of which appears in this number. Some very excellent original papers along the lines of experimental phonetics would interest specialists in this subject. Killian's very important article on bronchoscopy in small children, which will be reviewed in full, is well worthy of special study. Ritter of Berlin showed two of his cases in which he had operated the frontal sinus with retention of the anterior wall. This operation, which he proposed about two years ago, is the only operation of the kind which has proved practical. It is not in any sense a plastic, but by means of a small horizontal incision at the upper border of the previously determined form of the frontal sinus, the sinus is opened and curetted from above.

For those specialists who read German, a full set of these transactions should find a place in their libraries. Published immediately after the meeting, the papers are often unpublished elsewhere. The transactions, therefore, enable one to keep in touch with laryngologic progress in Germany.

Horn.

Handbuch der Speziellen Chirurgee des Ohres und Oberen Luftwege.

Edited by KATZ, PREYSING and BLUMENFELD. Published by Curt Kabitzsch (A. Stuber's Verlag), Würzburg. Price: Vol. III, Parts 1 and 2, marks 12. Vol. I, Second Half, Part 1, marks 6.

The first five parts of this monumental work have already been reviewed in these ANNALS. They dealt exclusively with the anatomic side of the subject. The two present volumes have taken up the beginning of the practical side. Since the publication of Heymann's Handbuch in the 80's, nothing has been attempted which gives such a complete reflection of the modern German school of specialists as the present work.

The first part of the second half of Volume I is a book of over one hundred pages and deals exclusively with the subject of stenoses of the upper air passages. Perhaps no one in Europe could have been more happily selected than Pieniazek of Krakau, who by the publication of his classical text book on this subject a few years ago, has become the acknowledged dean in this matter. Suffice it to say that the scattered literature on the subject has here been gathered together and carefully digested. The present work is the most complete of its kind in any language.

The bronchoscopic treatment of bronchial asthma has now evidently won for itself a place in our methods of treating this obstinate disease, and Pieniazek warmly recommends it, especially in the more obstinate cases. Sometimes he considers it necessary to repeat the treatment more than once.

The chapter on intubation, its indications and use, both for acute stenoses and for purposes of dilatation, is especially good. The subject of difficult decanulization is very thoroughly treated in great detail and many valuable suggestions are made.

The most interesting of all the set so far is the first and second parts of the third volume, a book of over 250 pages, and deals principally with the first part of Prof. Boenninghaus' article on the surgery of the accessory sinuses. To those who are acquainted with his text book of otology, much was expected in this article, and we have not been disappointed.

Practical and useful should be applied to every word in the entire book. His chapter on the differential diagnosis of the sources of pus found in different regions of the nose is a masterpiece of brevity and clarity. Every modern operation on the accessory cavities is carefully described, and his well-known skill in drawing and semidiagrammatic figures is given full play.

The publishers have, as usual, spared no expense in typography or illustrations, and if the subsequent volumes maintain the present high standard, the work will easily rank as one of the great masterpieces in the literature of the surgery of the ear and upper air passages. *Horn.*

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